

CYCLONES

IN ANDHRA PRADESH

**A multidisciplinary
study to profile cyclone response
in coastal Andhra Pradesh, India**



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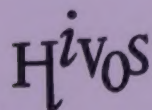
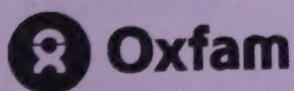
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A multidisciplinary study
to provide regional responses
to coastal Andhra Pradesh, India

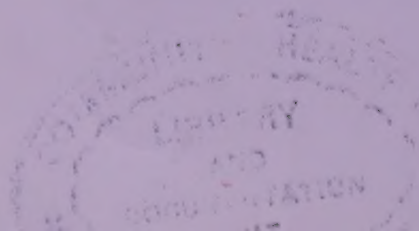
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FOREWORD

The cyclone of 1996 that hit the coastal state of Andhra Pradesh in India was the proverbial repetition of history. Cyclone hit the state even harder and more tragically in 1996. The government had the experience of dealing with the aftermath of numerous devastating cyclones in the past, and was prepared to face one. But still it was struggling to cope this time as well, with limited success. The same story goes for civil society as well.

Disasters are tragedies. But they are not the end of the story. The 1996 cyclone had few positive fall outs. It galvanised the thought process of many concerned individuals, community based organisations, non governmental organisations, donor agencies and a cross section of government officials. Interactions among these groups that followed the disaster, have produced mixed results. It underscored the most important basic principle of disaster management — that is disasters call for synergic action. Political will, policies and people's action should go together. Facilitating and amplifying this synergy is a challenge, especially for members of the civil society. To some extent, the various stakeholders in Andhra Pradesh state have taken pioneering lead to make this synergy a reality. The positive trend is clear from some of the recent initiatives such as the Vulnerability Reduction Fund Trust. Still a lot needs to be done on this front, as the experience of 1999 cyclone in Orissa teaches us.

The publication *Cyclones in Andhra Pradesh — a multidisciplinary study to profile Cyclone Response in Coastal Andhra Pradesh*, will add the necessary stimulus to evolve an informed debate. While the government and civil society complement their efforts to deal with disaster situations, the differences between their expectations, perspectives and styles of function have often hampered the results.

I sincerely hope that this book will help to iron out such differences. As the book reiterates, 'A paradigm shift is required to evolve sustainable disaster mitigation at the local level. But such a re-orientation demands that projects 'for the people' become programs 'with the people'. India's cyclone-prone states call for political commitment and policy action to tap capacities of local communities and blend them with creative government initiatives. I hope this book will help to start a meaningful debate about disaster preparedness in general and cyclone response in particular, not just within Andhra Pradesh or India, but in the entire South Asia region.

Prof. S. Parasuraman
Team Leader,
World Commission on Dams,
Cape Town.

April 2000

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The preparation of *Cyclones in Andhra Pradesh - a multidisciplinary study to profile cyclone response in coastal Andhra Pradesh* would not have been possible without the support and valuable contributions of a number of individuals and organisations. The solidarity, synergy, constant encouragement and reassurances extended by them helped in processing this document.

This initiative began with a commitment from collaborating organizations, Humanistic Institute for Cooperation with Developing Countries (HIVOS), Dutch Relief and Rehabilitation Agency (DRA), Oxfam and its partner organizations to meet the humanitarian challenge posed by the devastating cyclone, that hit the east coast of Andhra Pradesh in 1996. The study was an essential component of the initiative. The much needed financial support provided by European Community Humanitarian Office (ECHO) contributed a great deal to the effort.

We thank Oxfam for enabling this project to happen and for providing continuous intellectual, financial and moral support. We thank Oxfam's Regional Representative at Hyderabad, Roy D'Silva, Oxfam's National Director, John Gwynn and staff particularly Prema Balasubramaniam, Cheryl Xavier based in New Delhi and Hyderabad respectively for providing unwavering support. Special thanks to Rajendranathan, Ben Witjes, Julietta of HIVOS, to Roger Bellars, Humberto from DRA, Rupa Mukherje of TARU for their constant support.

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1

Introduction

OLD DISASTER, NEW SPIN

There is a growing realization, across all sectors, Government and Non-Government that the impact of natural and human-made disasters and the resulting loss of life, livestock, property, pain & suffering can be prevented and ameliorated. And that, disasters have to be tackled at the policy level as well as at the grass roots, and that institutional actions and peoples actions have to dovetail. While this is certainly a positive trend, there is much to achieve in making this a reality.

Disasters call for the synergy - that of policies and grass root action

The concept of a rational disaster management policy has yet to gain importance at the national level. The existing cyclone mitigation policy of the government is essentially a reworking of policies of famine relief, which by itself is a reflection of the thinking on social security in the 1930s. The conceptual basis of famine relief was remoulded into programmes for disaster mitigation, and public works programs were initiated by the Government of India in cyclone-affected areas "as a prophylactic measure to prevent the deterioration of the rural economy".¹

It was only after the two cyclones of 1969 that the state government of Andhra Pradesh instituted a Cyclone Distress Mitigation Committee (CDMC), comprising of technical experts such as meteorologists, engineers and administrators. A set of recommendations was made to the government in 1971. The point however is, it still raises an interesting question : do

¹ Government of India, 1981

India's cyclone prone states need a unique policy that blends capacities of communities and creative government initiative

policies and programs related to cyclones, by themselves help reduce vulnerability? There are views, that preventive and rehabilitative government policies, which emphasize on forecasting, prediction, evacuation and physical protection, actually encourage people to continue living in highly and historically cyclone-prone areas. Furthermore, in India, self-relocation and self-rehabilitation is a challenge at the best of times: neither people nor communities necessarily do it willingly, and few do it under coercion.

It is in dealing with this context that the central and state governments and non-governmental institutions, and the cyclone-affected people have to look to themselves and each other as best as they can, in evolving an appropriate response to cyclones. India, in this context the cyclone prone states need a unique policy, and practice to match with, that blends the traditional and tried-and-tested community preparedness, relief, reconstruction and rehabilitation processes with that of creative and innovative government initiatives.

The purpose of this study

The devastating cyclone that hit the coastal state of Andhra Pradesh (AP) on November 6, 1996, claimed 1,077 human lives and damaged 616,553 houses and 510,616 hectares (ha) of cropped area. East Godavari, West Godavari and Krishna districts bore the brunt of the disaster. The total losses were estimated at Rs 6129.25 crores (as per the *Memorandum of Cyclone Damages 1996*).

Oxfam, in collaboration with partner organizations, responded to the cyclone with immediate relief. Simultaneously discussions were held on the long-term requirements of affected people between, Humanistic Institute for Cooperation with Developing Countries (HIVOS), Dutch Relief and Rehabilitation Agency (DRA), Oxfam and its partner organisations. This led to the initiation of a cyclone reconstruction and rehabilitation project in East Godavari district, financed by European Community Humanitarian Office (ECHO). One of the components of the project was to carry out a study to better understand cyclone response in Andhra Pradesh. The scope of the study extended to exploring ways and means to identify how risk reduction and

response mechanism can be improved and to facilitate an informed debate on disaster policy issues.

International aid agencies have long dithered over deciding on the nature of their interventions in the post-relief stage, which is, as it stands today, restricted mainly to rehabilitation and development in the affected areas. Despite their vast international experience, these agencies have yet to link disaster preparedness in India with the broader developmental agenda of the state. Decisions and interventions in every post-cyclone situation so far have largely been on an ad-hoc basis that lacks vision, imagination and, indeed, co-ordination. Apart from governmental responsibilities, there is far greater scope for deeper and more intensive NGO intervention in comprehensive disaster management in the state.

Agencies are yet to link disaster preparedness and development work

A step in the right direction was taken at a post-cyclone meeting where various funding agencies informed their partner NGOs that they were releasing the money. What followed was an intense debate on the nature of the intervention: Would the programme be the same as one designed months before the cyclone, or a modified one? What would be the nature of the restructuring? What would be the depth of intervention impact?

The debate concluded that, either way, opportunity had been squandered, that not enough had been done to understand the impact of interventions in the field in the wake of the cyclones that had gone before. It also declared that the system of response was unfocussed and imprecise – particularly because both, a specific cyclone response mechanism and a general comprehensive disaster management policy, are yet to evolve. Compounding the problem is the fact there exists no profile of the nature of precise cyclone response in Andhra Pradesh, the most cyclone-battered state in the country. What the conclusion demanded was the necessity for a study to identify the special and immediate needs of the affected people.

The objectives of this study are:

- To examine the state government's disaster management strategy and assess its capacity to implement it
- To assess the capacity of the various other constituencies involved in cyclone disaster management

- To establish an interface between various constituencies
- To assess how the response matches the magnitude of the disasters
- To stress the relevance of disaster response within the broader context of development
- To suggest steps to improve the response at all stages of a disaster – including risk audits that incorporate vulnerability patterns, exploring risk reduction strategies, and finding the means to implement them

The first part of this study profiles the vulnerability of the AP coastline to cyclones. It goes on to profile major cyclones in the state over the past two decades. In the analytical section, the government and civil society's response to cyclones is fine-combed. There is a section on the evolution of government policy in cyclone disaster management. Specific issues relevant to community intervention, such as health, gender, equity and neutrality, are examined separately. Finally, the study highlights the weaknesses of the present mode of response and suggests some modifications.

The emphasis of the study is on the largely unaddressed issues of concern to disaster-affected communities. The vulnerabilities of weaker sections and inadequacies in warning, relief, healthcare and community rebuilding measures find special mention. Inevitably, such a subaltern approach would also necessitate a critique of existing policies, procedures, and technological options. However, we have been careful to minimise technological and procedural jargon: our attempt has been to use a layperson's language and style of presentation.

We hope that this study will be seen as an initiative towards a better, comprehensive, and people-friendly disaster response policy, not just for cyclones, but for other disasters as well.



2

CYCLONES EXPLAINED

Cyclones are such ubiquitous disaster phenomena that they go by many names the world over; so understanding their nature would help minimise the destruction

Cyclones are global phenomena and go by many names: tropical cyclones in India, typhoons and hurricanes in the West and Willie-Willies in Australia. Usually located up to 30 degrees above and below the equator, tropical cyclones are the bane of the warm oceans.. In terms of diameter, they may be relatively puny – 50-320 km – but their effects dominate thousands of sq km of ocean surface and the lower atmosphere. A cyclone's perimeter may measure 1,000 km, but its actual "powerhouse" is located within its 100-km radius: near the eye – the relatively calm hub of the wheel – winds may hit 320 kmph.

Tropical cyclones are concentrically intensifying swirls of cloud and rain that escalate from depressions to tropical storms. There are two meteorological imperatives for a cyclone to occur: the sea surface temperature has to be more than 26.5 degrees Celsius; and the formation of cyclone requires an anti-cyclone – a body of moving air with higher pressure than the surrounding air -- in the upper troposphere. A tropospheric anti-cyclone creates a reverse mirror of very low pressure and high winds at the sea surface.

A cyclone has a warm vortex – a warm core that develops through the action of cumulonimbus towers (tall, billowing clouds, with dark bellies that indicate rain) releasing latent heat through condensation. In a self-motivating process, the warm core intensifies its anti-cyclone cap.

Tropical cyclones are the bane of the warm oceans

When the warm air, heavy, humid and full of water vapour, rises, its place is taken by air rushing in from the sides. The warm rising air meets cooler air and releases its water vapour in the form of rain. The earth's rotation gives this moving air a twist so that the entire system begins to revolve. Cyclones spin clockwise in the northern hemisphere and anti-clockwise in the southern, moving initially west-northwest and then northeast-ward.

The enormous energy required for the air to lift the water vapour appears in the form of heat. The heat increases the rate of ascent of the air-vapour combination, and a self-sustaining cycle begins to develop. More and more water is released, and thus more heat. The more water and heat released, the faster the cycle goes, and soon the entire system expands in bulk. A fully mature cyclone resembles a funnel, narrow at its inception and like a wide upturned top when mature. Nearly all the inflowing air escapes upward in the narrow funnel, which may vary in height between 5 and 20 km.

Because the wind system revolves rapidly, centrifugal force tends to kick the air outwards, reducing the pressure at the centre through a suction process. The centre becomes the calm "eye" of the cyclone. The pressure at its perimeter is very high, and the speed of the cyclone's revolution accelerates in an attempt to fill the low pressure area. However, the faster it moves, the more the proportionately-increasing centrifugal force throws the air outwards. Soon, there are very fast, circular winds of speeds often crossing 74 mph (approximately 120 kmph)

Once the process takes hold, the cyclone begins to edge forward, spinning and billowing like a dervish. Its progress brings it into contact with more warm sea and air, and the process becomes self-sustaining: now, with a life of its own, it will continue to move and expand until it either crashes into land or runs into an area where the sea is cooler.

Movement

Tropical cyclones, steered by the great anti-cyclones overlying the tropical oceans, follow a basic parabolic path. But cyclones have also been known to behave erratically and change direction without warning.

Over oceans, cyclones travel at a speed of a stately 16-24 kmph. Given the variables of surrounding weather patterns, it is difficult

Given the variable of surrounding weather patterns, it is difficult to predict cyclonic landfall; but that is, obviously, no excuse

to predict their landfall; but once they hit land, they may move inland with destructive force for 160 km or more, depending on the original size of the storm. But landfall is a losing proposition: the further inland they move, the less force they will have. They cause most of the damage in a swathe that reaches usually no more than 50-60 km from the coastline.

Landfall

Landfall is death for cyclones, but it is an exorbitant price that humans have to pay for its demise. Soon after crossing the coast, cyclones begin to dissipate, de-energised by friction with land and by lack of moisture from the warm oceanic surface. The winds drop in ferocity, and the atmospheric pressure at the eye rises rapidly and "normalises".. Cyclones die when the pressure all across their bulk evens out.

Occasionally, rebuffed by a cool sea or land surface, they return to sea in a sudden switchback to breathe deep and hit land at usually unpredictable locations.

Cyclones do most of their damage to structures; most fatalities occur from the slashing downpour and flooding which follow inevitably in their wake. Gigantic waves are tropical cyclone specialities. In shallow water, they whip up short, low waves, each carrying large amounts of water, causing an upslope of the sea at the coast and generating powerful shore currents.

Storm surges

These storm surges (tidal waves) are caused by a combination of the raising of the sea level by wind-driven water and low pressure at the eye of the cyclone. Surge height (up to all of seven metres) and length (up to 50 km) depends on the tides, the rate of water run-off from the land, onshore winds, and coastal contours and configuration.

Surges cause the most havoc not in their incoming phase but when they recede, sucking away land, property, trees and living beings with the force of their retreat. Even while windspeeds drop when the cyclone moves inland, the accompanying storm surge-propelled floods escalate their destruct potential. On an average, storm surges kill seven times more people and damage three times more crops than severe but surge-free cyclones.

Storm surges cause the most destruction – not in their incoming phase but through suction when they recede

Stretches of the coastline in the Bay of Bengal have the world's shallowest waters, and storm surges tend to be greatly amplified where the coastal water is shallow. In fact, the world's highest storm surge (41 ft) was reported from Bakerganj.¹

Wind

Cyclonic winds – both in their linear-moving and rotary forms – cause massive damage to houses, agriculture fields and infrastructure. In fact, the Indian Meteorological Department (IMD) uses windspeed to measure the force of cyclones.

Rain

Cyclones are usually accompanied by heavy downpours, measuring anything from 250 cm to a trace. Rainfall of 50 cm through the course of a two-day cyclone is an accepted occurrence.²

Global warming

Global warming, caused by the increasing quantum of greenhouse gases such as carbon dioxide, raises sea surface temperature and exacerbates cyclone frequency, intensity, duration, and track modification.³

Global warming also raises sea levels through the continuous, and irreversible, melting of the polar ice caps, eventually leading to the inundation of chunks of coastal land.⁴

Frequency of cyclones

Cyclones vary in frequency in various parts of the world: the 7,516.6-km-long Indian coastline is the earth's most cyclone-

¹ Mandal, GS, *Natural Disasters in Disaster Management*, (Ed) Vinod K Sharma, Indian Institute of Public Administration, New Delhi, 1994, pp 168-179

² Winchester, Peter, 1992, *Power, Choice and Vulnerability: A Case Study in Disaster Management in South Asia 1977-1988*, James and James, London

³ Chittibabu, P et al, *Influence of Global Warming Induced Climate Change on Storm Surges in the Bay of Bengal*, paper presented at the Conference on Natural and Technological Coastal Hazards, December 2-4, 1996, Sri Venkateswara University, Tirupati, India.

⁴ Myers, Norman, *The Ultimate Security: The Environmental Basis of Political Stability*, W W Norton, New York, 1993

battered stretch, and staggers under incalculable annual losses of lives and property. Although tropical cyclones in the Bay of Bengal and the Arabian Sea are the least frequent and usually of moderate intensity, the Indian subcontinent remains the worst cyclone-affected region in the world.

In the Bay of Bengal, warm seas and still air normally occur in combination during the months of April-May and October-November. Cyclones strike here in May-June and October-November, with the monsoon's onset and retreat. In the century between 1877 and 1977, 20 per cent of cyclones in the Bay of Bengal crossed the coast in November and 18 per cent in May.

Between 1877 and 1977, 20 percent of cyclones in Bay of Bengal crossed the coast in November and 18 percent in May

INTERNATIONAL CLASSIFICATION OF STORMS

TYPE OF STORM	WIND SPEEDS			
	Kmph	knots	mph	m/sec
Depression	30-50	17-27	10.4-16.6	4.7-7.5
Deep depression	50-65	28-33	17.2-20.3	7.8-8.2
Cyclonic storm	65-90	34-47	20.9-28.9	9.4-13.0
Severe cyclonic storm	90-120	48-63	29.5-38.7	13.3-17.5
Severe cyclonic storm (with core of hurricane winds)	Above 120	Above 64	Above 39.1	Above 17.8

(Kmph: kilometres per hour; mph: miles per hour; m/sec: metres per second)

(Source: Cyclone and Its Effects: A Cyclone Information Manual, Mission on Natural Hazards Mitigation, Indian Institute of Technology, Madras)

(In the same period, 337 cyclones crossed the east coast of India and Bangladesh between the latitudes of 8 degree N and 22 degree N. Nearly a third of them made landfalls on the northern Orissa and Bengal coasts between 20-21 degree N. The next most cyclone-prone region was the Krishna delta in AP at the latitude of 15-16 degree N. Today, the most vulnerable districts in the state are Nellore, Krishna, Srikakulam, and East Godavari.).



3

Disasters in India : A short profile

BAND-AID IS NOT ENOUGH

*For the poor,
post disaster
loss of territory
and survival
resources mean
a very long
recovery
timeframe*

The world's most geographically, topographically and demographically diverse country, comprising some of its most hospitable and inhospitable regions and climates - dealing with equally myriad disasters is a formidable task

Every year, India, the world's second-most populous nation, is given its inevitable dose of disasters, both natural and humanmade – a battery of floods, droughts, cyclones, earthquakes, communal riots, armed conflicts, fires and epidemics that would bring other nations to their knees. The world's most geographically, topographically and demographically diverse country, comprising some of its hottest and coldest spots, its wettest valleys and driest deserts, dealing with myriad disasters is an extremely challenging task. India's resources might well theoretically be infinite, but recurring disasters strip the country of its pride in them.

Of the country's estimated population of one billion, about 40 per cent live in poverty. The poverty of India's poor has two facets to it: one is a constant refrain, a traditional, longlived and ongoing process of sheer survival; the other is the opportunistic, "sudden impact" poverty created by disasters, which bring with them further impoverishment, residential displacement, and even forced migration. Since most of India's poor live in close economic and spiritual communion with the land they occupy, the post-disaster loss of territory and survival resources means a very long recovery timeframe.

When we speak of loss here, we are dealing with an interconnected host of issues – loss of life, disability of breadwinners, damage to property, and the loss or degradation of entire life-supporting systems. The effects of cyclones, for instance, range from killing and debilitating fisherfolk, destroying their fishing craft and gear, to damaging the looms and raw materials of weavers, to flushing coastal farmers from their land. Riparian floods ravage the harvests of one-season-one-crop farmers and permanently waterlog once-fertile land. Earthquakes dispossess the peoples of entire districts for as long as a decade.

Loss here means an interconnected host of issues and disasters – loss of life, disability, damage, degradation of entire interlinked life-supporting systems

Disaster-caused deprivation in India is most acutely felt by the poor, victimised on a constant basis by their financial inability to relocate to safer havens from makeshift dwellings in disaster-prone areas. The demands of proximity to resources of livelihood, lock fisherfolk and marginal farmers, for instance, to coastal regions perennially vulnerable to storms, winds and floods. In a sense, life for many of India's poor is an unending struggle from one disaster to another. The relentlessly battered state of Andhra Pradesh, the focus of this study, is often confronted with a meteorological perversity – severe drought followed by great floods.

But, behind the frantic facade of “official” relief and rehabilitation activity, people have learnt to cope – notwithstanding the fact that media headlines, legislative debates, political sloganeering and even charity efforts often overlook the coping mechanisms of indigenes. The popular, but incomplete, picture of the disaster-affected is often that of “helpless victims”, the passive targets of handouts.

Nothing could be farther from reality. By force of circumstance, India's poor are nothing if not adaptable. During droughts, they traverse hundreds, even a couple of thousand, of miles of well-travelled migration routes – the most desperate ones boarding the first train to anywhere. Some desperate migrants, willy-nilly becoming part of the teeming, cheap casual labour force in towns and cities, never return. Many of the stubborn – or, perhaps, the less hopeful – continue to cultivate the floodplains till the rivers swell unambiguously. To many others, life teaches the virtues of nimbleness and travelling light: the menacing keening of a cyclone means that it is time to rush to the nearest concrete

Lack of standards, definitions and documentation makes disaster data collection a difficult task

building – a school, a place of worship, a hastily constructed and cramped government shelter. There are commonly-told stories – and the inevitable news photographs – of men, women and children, swept by storm surges, seeking refuge atop coconut trees, precariously perched aloft for days. These are the human stories – soppily informed by the media – behind the grim statistics of disaster reportage.

However distasteful and dehumanising it may seem to be, dealing with cold statistics is inevitable in a study of disasters. In the decade 1987-1996, disasters in India affected, on an average, more than 56 million people and killed 5,063 every year, says the *World Disasters Report 1998* of the International Federation of Red Cross and Red Crescent Societies. Between 1985 and 1995, disasters racked up an annual economic loss of about US dollars 1883.930 million, as estimated by the Centre for Research into the Epidemiology of Disasters (CRED), Brussels. But CRED cautions that data on the financial costs of disasters are extremely difficult to gather and verify. Lack of standards, accepted definitions and documentation mechanisms make disaster data collection and collation a researcher's nightmare in India. .

During the '90s, the decade declared by the United Nations as the International Decade for Natural Disasters Reduction, and faced with these mindboggling figures, the Indian government attempted to put scientific disaster response mechanisms in place on a priority basis. Various government bodies and non-governmental organisations took part in this exercise – with wildly mixed results. The Central government's apex body that deals with disasters, the National Crisis Management Committee under the Union Ministry of Agriculture and Animal Husbandry, took the lead in these efforts.

On paper, the coordination of the government's natural disaster response mechanism is the job of the Natural Disaster Management Division of the Agriculture Ministry. The Health Ministry has to contribute to the disaster management effort through its Emergency Medical Relief Division. Humanmade disasters such as communal and ethnic riots, other conflicts, and refugee situations are dealt with by the Home Ministry. Sadly, despite the best of intentions of various departments, an essential synergy between them, without which chaos is inevitable, is often

found missing in disaster scenarios. The one saving grace is that the armed forces usually do a commendable job of rescuing people affected by disasters and handling the logistics of supplying relief material to them.

The government's blueprint for disaster response, the Contingency Action Plan for Natural Calamities, is more a reactive than a proactive R&R effort. The government's stress is on relief, not reduction – a plan that is at variance with disaster preparedness and reduction as the priority areas to be stressed upon, according to current international practice.

Disaster preparedness and reduction should also lead to holistic development planning and action. Given initiative, disaster management can become a key node for initiating action in this direction. In actual practice, this move would mean, among many other things, extensive earthquake-resistant housing in seismic zones, the careful construction and layout of roads, railway lines and other structures on the flood plains to aid natural drainage, a long-term drought management mechanism, response material traffic control and, wherever possible, the setting up of early warning mechanisms.

The last should have been in place years ago. Despite a battery of coastal weather radars and early warning systems that facilitate – or should facilitate – proactive and rapid evacuation, high-velocity cyclonic winds hit the east coast of India regularly on cue, causing incalculable damage. With increasing frequency, earthquakes buck the northern Himalayan region and the Deccan plateau in southern and central India. And floods annually inundate vast tracts of central and eastern India for almost a quarter of every year. Natural disasters post their own early warnings by their very punctuality – but they are hardly ever heeded.

While there is a certain inevitability to disasters, there is none, necessarily, to prolonged human suffering and impoverishment. As often found in disaster scenarios, relief and shelter, despite the potential for resource mobilisation, still remain beyond the reach of many poor people, by design or default. By now, one aspect of disaster relief and rehabilitation should have been made imperative: to treat R&R as an inalienable people's right, not as charity.

The government's blueprint for disaster response is more reactive than a proactive relief and rehabilitation effort

INDIA-VITAL STATISTICS (1998)

Capital	: New Delhi
Area	: 3 287 263 sq km
Population (1991 census)	: 846.3 million
Male	: 439.2 million
Female	: 407.1 million
Population (2025 projection)	: 1,330.2 million
Urban population	: 27 per cent
Rural population	: 73 per cent
Density (per sq km)	: 273
Life expectancy (average 1994)	: 62.8 years
Male	: 62.1 years
Female	: 62.7 years
Calorie intake (av. Per person per day 1992)	: 2,395 kcal
Literacy (1993)	: 52.11 per cent
Male	: 64.3 per cent
Female	: 36.0 per cent
Sex ratio (female/1000 male)	: 927
Infant Mortality Rate (1994)	: 72
Children dying before Age 5 (1992)	: 3.1 million
Maternal mortality (/100,000 live births, 1993)	: 570
Population above 60 years	: 6.1 per cent
Crude Birth Rate (per 1,000 people 1995)	: 21
Crude Death Rate (per 1,000 people 1995)	: 9.8
Agriculture Labourers (1990)	: 64 per cent
Industry labourers (1990)	: 16 per cent
Services labourers (1990)	: 20 per cent
Population without access to Health services ('85-95)	: 135.2 million
Population without access to safe water ('90-'95)	: 171.3 million
Population without access to sanitation ('90-'95)	: 640 million
Disabled people (as per cent of total population -'95-96)	: 0.2 per cent
AIDS cases (UN estimate-1996)	: 2 million
Smokers (WHO 1990) male/ female	: 53 percent / 3 per cent
Total road (1996-97)	: 2.7 million km.
National Highway (1996-97)	: 34,298 km.
Rail network (1996-97)	: 62,660 km
Passengers carried by air taxi	: 3.6 million
Coastline	: 7,516-km
GDP at factor cost (96-97)	: 287303 million us dollars
GDP per capita ('95)	: 350 us dollars
Newspapers and periodicals (1996)	: 39,149

States : 25 (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal)
 Union territories : 6 (Andaman and Nicobar Islands, Chandigarh, Dadra and Nager Haveli, Daman and Diu, Lakshadweep, Pondicherry)

(Sources: India 1999- A Reference Manual, compiled and edited by Research, Reference and Training Division, Publications Division, Ministry of Information and Broadcasting, GOI, 1999. Statistical Outline of India 1998-99, Tata Services Limited, 1998. Malayala Manorama Yearbook, 1999)

DISASTERS IN INDIA

Population affected by disasters	:	6 per cent
Earthquake prone area	:	57 per cent
Flood prone area	:	11.2 per cent
Flood prone area in 1998	:	37 per cent
Drought prone area	:	28 per cent

(Source: NCDM)

Major cyclones in India

Of India's **7516.6 km** coastline, the most cyclone-vulnerable area is the East Coast because of geographical and demographic reasons. Thickly populated coast of Andhra Pradesh bears the brunt of cyclones. However, one of the worst recent cyclones hit the West Coast at Kutch in Gujarat in June 1998. Some of the worst cyclones in India were¹:

AP cyclone of November 14-20, 1977: Population affected: 7.1 million. Lives lost: over 8,000. Crop area affected: 3.6 million hectares (ha). Damage to houses: 1.01 million. Damage to public utilities: Rs. 1,716.6 million

Orissa cyclone of June 4, 1982: Population affected: 7.32 million. Lives lost: 243. Crop area affected: 1.58 million ha. Damage to houses: 819,000. Damage to public buildings: Rs 5,591 million

AP cyclone of May 5-9, 1990: Population affected: 7.78 million. Lives lost: 928. Crop area affected: 45,000 ha. Damage to houses: 1.4 million

AP cyclone of November 6, 1996: Lives lost: 1,077. Crop area affected: 511,000 ha. Damage to houses: 609,628. Damage to public buildings: Rs 5,591 million

Gujarat cyclone of June 9, 1998: Lives lost: 1,308. Land washed away: 10,000 ha. 10,000 houses completely damaged, 5,000 partly damaged

Sources:

1. *Indira Gandhi National Open University (IGNOU), Disaster Management: Methods and Techniques, Increased Understanding of Disasters - I (1), New Delhi, 1998*
2. *State Government memorandums on cyclones, Relief Department, Government of Andhra Pradesh*



4

Profile of Andhra Pradesh

WINDS OF MISFORTUNE

The fifth largest state in India, Andhra Pradesh is a forced juxtaposition of high political awareness and unimpressive standard of living. Cyclones are its bane.

Andhra Pradesh (AP) is the fifth largest state in India, in terms of both population and area. Spread over 2.75 lakh sq km, it comprises 8.4 per cent of the country's total geographic area. AP's population of 66.5 million is about 8 per cent of India's total, according to the 1991 census. Extrapolated from the same census, the state's population crossed 70 million in 1995, with 1.2 million heads being added annually. AP's growth rate of 2.71 per cent – which increased between 1981-91 and is slightly higher than the national average – is in defiance of the appreciably decreasing growth rate of the southern states. Nearly 27 per cent of the state's citizens live in its cities and urban conglomerations.

The state has a literacy rate of 44.09 per cent, with female literacy at 32.72 per cent. The infant mortality rate is 64 per 1,000 live births, substantially lower than the Indian average of 74 but over four times that of Kerala, which at 13 per cent is the lowest in the country. The total number of people below the poverty line is 15.4 million, or 22 per cent of the state's population. (The definition of poverty adopted in India is, at best, modest, taking into account only consumption, not the capabilities. It is defined as a monthly per capita expenditure below a specified level called "the poverty line", based on annual data collected by the National Sample Survey Organisation.).

AP has 1,536 large- and medium-scale industries with a total investment of Rs 305,020 million; they provide employment to 644,480 people. Besides, there are 124, 209 tiny- and small-scale industries with an investment of Rs 21,441 million, employing 1,068,482 people (March 1998).¹

State politics

AP is one of the most politically vibrant states in India. Its contribution to national governance is commendable by any yardstick: three presidents and a prime minister. Over the past two decades, it has witnessed the rise of one of the country's most powerful and technologically influential regional political parties, the Telugu Desam Party (TDP). In the early '90s, the TDP was responsible for social reforms such as total prohibition and the provision of rice at the rock-bottom price of Rs 2 per kg through the public distribution system. In the interests of political expediency, however, prohibition was lifted in 1997 – by a TDP government. And, for much the same reasons, the cheap rice scheme was also abandoned in July 1996.

The state capital, Hyderabad, fast emerging as the national hub of Information Technology, has been nicknamed "Cyberabad"

The state capital, Hyderabad, fast emerging as the national hub of Information Technology, has been nicknamed "Cyberabad". It is in a race to take over the mantle of India's premier cyber-city from Bangalore in the neighbouring Karnataka state. AP's flamboyantly computer-savvy chief minister, Chandrababu Naidu, has initiated a project to link the state's far-flung districts and *mandals* (an administrative block comprising 15-30 villages) through a computer network that has the country's highest rural connectivity.

While this network has also been designed to handle cyclone disaster management, the chief minister's electoral support falters in precisely those quarters that stand to benefit from computerised disaster management – the cyclone-vulnerable rural regions. Here, he is perceived as being too technology- and not grassroots-oriented. It is a dichotomy that reflects the urbo-rural perceptions of India as a whole.

¹ Publications Division, 1999, *India 1999: A Reference Manual*, compiled and edited by the Research Reference and Training Division, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi

Outside of the mainstream political process, extreme Left groups, commonly known as "Naxalites", have been active in the Telangana region and certain other pockets in AP for decades. The Naxalites usually operate underground, often in violent conflict with the state system of governance, equally often reportedly with the support of landless peasants whose cause they claim to espouse.

The regional press in AP is politically critical, self-reflective and has a deep rural reach, with major Telugu dailies frequently carrying district supplements. The civil society here is active to the point of exhausting the state administration. Numerous NGOs and donor organisations contribute to disaster mitigation efforts, alongside government initiatives. In fact, in a pioneering move in 1998, the AP government constituted a Vulnerability Reduction Fund with the participation of NGOs and donor agencies.

Administrative divide

The state is administratively divided into 23 districts, 1,104 *mandals* and 29,293 villages. The entire state itself is apportioned in three geopolitical divisions – Telangana, Rayalaseema, and Coastal Andhra.

It is estimated that about 44 per cent of the state is desperately exposed to tropical storms, floods and related hazards, with the coastal belt as the most vulnerable. The consequences of cyclones

REGION-WISE AREA AND POPULATION

Region	Area (in sq kms)	Population (in thousands)
Telangana	114,840	26,096.08
Rayalaseema	67,299	11,685.72
Coastal Andhra	92,906	28,733.21
Total state	275,045	66,515.01

(Source: Planning for Management and Mitigation of Cyclone and Flood Disasters in Andhra Pradesh, March 1994, Centre for Disaster Management Studies, National Institute of Rural Development, Hyderabad)

tend to reach deep into the state when all major and minor rivers, which drain into the Bay of Bengal, back up and swell, particularly during the monsoons.

The total length of national highways in the state is 2,949 km, that of state highways and Zilla Parishad roads is 43,763 km and of district roads is 103,971 km.

In terms of safe shelter, which is a measure of security and protection for a family, Andhra Pradesh is well behind the national average. The state government, which took part in a national sample survey, found that in the period between October 1971 and September 1972, of the 34,319 houses taken up for construction, as many as 16,249 were *kutcha* buildings of doubtful durability and safety, each costing merely, on an average, Rs 329. The compounded perversity lies in the fact that, in the Eighth Plan, the Andhra Pradesh Housing Board was actually allotted only Rs 22.91 crores of the provision of Rs 31.85 crores – and the amount it spent was only Rs 19.46 crores.

About 44 per cent of the state is exposed to tropical storms, floods and related hazards

Coastline

The state of Andhra Pradesh has a long coastline stretching approximately 1,030 km, and an equally long history of cyclones of varying intensity over the past 100 years. Perched along the coastline are 2,482 villages with a total population of 54.33 lakhs (1980). Within the 5-km swathe extending inside from the coast are 500 villages with a total population of 11.63 lakhs; between 5-10 km, there are 601 villages with a total population of 15.02 lakh; between 10-20 km, there are 1,381 villages with a total population of 27.68 lakhs.

Coastal Andhra Pradesh covers an area of 92,906 sq km with a total population of 28,733,000. The eastern part of the state, where the coastal districts lie, has three distinct physical zones: the coastal plain, the Eastern Ghats, and the Western penneplains. The coastal plain extends from Srikakulam in the north to Nellore in the south, a distance of about 1,030 km. The Eastern Ghats, unlike the Western Ghats, do not run in a continuous line. The penneplains form a wide belt and include most of Telangana districts, and the Kurnool and Ananthapur districts of the Rayalaseema region. (Refer to the table "Statistical Profile of the Coastal Districts" on page 23)

DISTRICT-WISE DETAILS OF COASTLINE

District	Length of coastline (km)
Srikakulam	182
Vizianagaram	25
Visakhapatnam	155
East Godavari	177
West Godavari	17
Krishna	122
Guntur	62
Prakasam	116
Nellore	174
Total	1,030

(Source: Community Cyclone Shelters, article in Devastation and Development, published by the Andhra Pradesh Voluntary Organisations and Social Workers' Association, Hyderabad. November 1978)

The terrain largely slopes from west to east. Most of the area in the districts is plains land, except for parts in the northern districts. The main lines of communications – like the National Highways, the railways, state roads and connecting roads to the villages – run across the grain of the natural drainage terrain and therefore has a lot of bearing on the current phenomenon of flooding due to both rains and cyclones.

The land on either side of the Godavari and the Krishna rivers consists of extensive, flat delta plains levelled at between 4-6 feet above mean sea level. These are the areas most vulnerable to storm surges. There are, however, small patches with strips of high ground running almost parallel to the coast that offer relative safety from the inundation caused by storm surges. These areas are offset by runs along the coast where minor rivers and streams back up with the tides, rendering adjoining land liable for inundation.

The coastal districts are primarily agricultural. Guntur, Krishna, and East and West Godavari are noted for their complex and highly productive network of irrigation canals founded on the Krishna and Godavari rivers. In addition to cyclones, these four districts, together with Srikakulam, also face the brunt of floods

NATURAL BARRIERS

A distinct but shifting variability in vulnerability characterise the topography of the state

All manner of destruction and destitution follows in the wake of cyclonic storms and not all of coastal Andhra Pradesh is equally susceptible. In the north, the Eastern Ghats from Srikakulam to Visakhapatnam and part of Godavari nearly reach the sea, rendering the districts within relatively less vulnerable to storm surges. They are, however, more vulnerable to wind damages and to floods that accompany the cyclones. To the south, Nellore district is somewhat shielded by the Buckingham Canal which runs parallel to the coast. The canal has on occasion absorbed and buffered storm surges, preventing them from charging inland.

More than 70 per cent of the major cyclones that hit the state's coastline affect the Deltaic region of the Krishna and Godavari rivers. Nellore, Krishna, Srikakulam, and East Godavari are the most vulnerable districts. In these areas, coastal mangrove forests are destroyed on a massive scale. Mangroves, described as "coastal woodland", are valued for being "natural barriers" in the cyclone-prone coastal areas – they routinely absorb the impact of storm surges. However, rapid encroachments and commercial aquaculture farms are threatening these tidal (or swamp) forests with rapid depletion.

Kiran Keswani

during the monsoons. The coastline bracketed between Srikakulam in the north and Nellore in the south is battered by at least one cyclone every year. The entire state, in fact, suffers the consequences of cyclones because every district, except those of Vizianagaram, West Godavari and Guntur, has one face or more with over 100 km of very vulnerable seacoast.

The area immediately close to the coast is comparatively less populated, less accessible due to poor communications and with negligible availability of drinking water. The people living in the belt of 20 kms from the coast generally comprise Fisherfolk and weaker sections and the majority have thatched type of houses which are very vulnerable to the wind pressures of cyclonic gale which exceed 100 kms per hour. There are very few permanent buildings by way of temples, churches or the odd school, which can afford some protection to the people from the effects of cyclones. Since 1980 there has been growth in population and the corresponding increase in structural assets which are vulnerable to the hazards of cyclone.

In the past two decades, the state has been ravaged by three major cyclones, progressively publicised by the world media

Stormy history

Andhra Pradesh has a chequered history of cyclones and floods. The state has a recorded experience of 71 cyclones in the past 105 years (1892-1997), each time with colossal damage. Between 1892 and 1977, 56 cyclones affected seven coastal districts. Nellore district was struck 15 times, Krishna district 14 times, Srikakulam district 10 times, East Godavari district 8 times, Prakasam district 6 times, Visakhapatnam twice and West Godavari district once.

In the past two decades, the state has been flooded by three major cyclones, progressively publicised by the world media. The first, in November 1977, riveted the world's attention on the state by virtue of its mindboggling mortality figure – conservatively put at 10,000.

The second major storm occurred in May 1990. It affected every coastal district and that of Khammam in the interior, causing damages amounting to about Rs 2,300 crores. The third, in November 1996, was small in comparison with the previous cyclones, and restricted its impact mainly to the two districts of East and West Godavari. But, in monetary terms, the material damage it caused was the biggest – about Rs 2,142 crores.

The coastline between Nizampatnam and Machilipatnam is prone to storm surges. The fertile deltas of the Godavari and Krishna rivers, which contribute substantially to the state's economic prosperity, are prone to frequent floods and consequential drainage problems, further compounded in the aftermath of cyclones. But the state's problems are multi-disaster: some parts of the Telangana region are affected by the monsoon floods; and all the districts of Rayalaseema and some districts in the Telangana region experience recurring drought.²

The location of the state, and its environment, have led to its long history of cyclones and to damages of a very high order. The extremely vulnerable conditions in the state are compounded by several factors:

- Almost 50 per cent of the storms in the Bay of Bengal become severe cyclones often accompanied by storm surges

² Source: M Sahoo, 1999, IAS : Andhra Pradesh Government's Policy on Disaster Management, India Disasters Report (ed) Dr Parasuraman S and Dr Unnikrishnan PV, Oxford University Press, 2000.

- Low-lying areas along the coast are vulnerable to extensive flooding and deep inland seawater incursion
- High concentrations of population, infrastructure and economic activities along the coast
- Lack of proper maintenance of the flood protection and irrigation systems – drains, embankments, etc
- Lack of a comprehensive coastal zone and delta management
- Over-development and denuding of coastal zones of their protective vegetation belts
- The thrust of the state government being primarily on saving human lives and on restoring infrastructure, and less on preparedness.

STATISTICAL PROFILE OF THE COASTAL DISTRICTS

District	Area (Sq km)	Population		SC & ST (lakhs)	Total (lakhs)	Irrigated area (lakh ha)	Roads (km)	Cropped area
		Rural	Urban					
Srikakulam	5,837	20.31	2.90	3.51	23.21	1.98	4,712	4.53
Vizianagaram	6,539	17.47	3.64	4.10	21.11	1.57	3,560	4.45
Visakhapatnam	11,161	19.76	13.09	7.26	32.85	1.53	5,680	4.52
East Godavari	10,807	34.60	10.81	10.02	45.41	4.41	6,025	7.56
West Godavari	7,742	27.89	7.29	7.12	35.18	5.92	5,791	6.97
Krishna	8,727	23.74	13.24	7.05	36.98	4.65	6,540	7.43
Guntur	11,391	29.20	11.87	7.55	41.07	3.66	7,006	8.63
Prakasam	17,626	23.05	4.54	6.51	27.59	2.08	8,325	5.96
Nellore	13,076	18.23	5.70	7.37	23.93	2.98	6,725	3.56
Total	92,906	213.75	73.08	60.49	287.33	28.78	54,364	53.61

(Source: Andhra Pradesh at 50, a Data Based Analysis, February 1998, published by Data News Features, Hyderabad)



5

History of Cyclones in Andhra Pradesh

TOO MANY, TOO MUCH

Andhra Pradesh has a long and torturous history of cyclones and floods: it has "experienced" 71 cyclones in the past 105 years (1892-1997), and the damage every time has been colossal

Between 1892-1977, seven coastal districts were struck by 56 cyclones: Nellore district was struck 15 times, Krishna 14 times, Srikakulam 10 times, East Godavari 8 times, Prakasam 6 times, Visakhapatnam twice, and West Godavari once. (Refer to the table 'District-wise details of Cyclones in AP (1892-1992) on Page 24)

Exactly three decades ago, in 1969, the Government of India had constituted the "Cyclone Distress Mitigation Committee" (CDMC) chaired by Dr P Koteswaram, the then Director General of Observatories, Indian Meteorology Department (IMD). The committee had submitted its report in 1971 with 49 sterling recommendations, some of which are yet to be implemented.

The deadly three

In the past two decades, three major cyclones caused immense loss of human lives and livestock and massive damage to property, both of the people and the government. The first, in November 1977, was a media monster as well, catching the attention of the whole world due to about 10,000 human deaths and huge material loss. The one positive outcome was that for a period long enough to make a difference, the national and international focus on the state of Andhra Pradesh prompted the state government to take a serious look into the management of

disasters. A still existing Contingency Plan for cyclones and floods, on the pattern suggested by the CDMC's report, was formulated in 1981, and updated in 1987.

The second major storm, in May 1990, ripped through all the coastal districts and that of Khammam (10 districts), and caused 976 deaths and damage amounting to about Rs 2,300 crores.

The third "small-core storm", in November 1996, was what is called a "severe cyclonic storm", smaller in comparison to the previous cyclones. It affected mainly the districts of East and West Godavari but, in monetary terms, killed more people (1,077) and caused a greater amount of damage (Rs 2,142 crores).

After the third storm, the state government had appointed a high-level committee to prepare a new draft plan that incorporated the lessons learnt by the Collectors, sectoral departments and others from the previous cyclones.

The cyclone of November 1977 was a global attention-catching media monster as well, due to the fact that 10,000 people died and the material loss was massive

Two decades of death

The November 1977 cyclone has come to be acknowledged as one of the biggest calamity, in terms of human losses, in India. The other two "major" cyclones in Andhra Pradesh, in terms of their magnitude and scope of devastation, were in 1990 and 1996. The two decades between 1977-96 were peppered with other cyclones of relatively lesser intensity, some of which did not cross the coast but caused great damage in the areas close to their route.

The cyclones in these two decades are hereafter described in chronological order. Highlights of their characteristics, origin, growth, path till dissipation, areas affected, and losses in these areas are given below to profile these events.

NOVEMBER 1977

The cyclone track map of October-November 1977 shows three cyclones in the Bay of Bengal – the first on October 27-31, the second on November 9-13, and the third on November 14-19.

The cyclone of November 19 was the deadliest: 9,941 people died, 900 went missing, 34 lakhs were rendered homeless, cattle

and livestock losses stood at Rs 2. 5 lakhs, crops were lost in 33,36,000 acres, and 1,014,800 houses were damaged. Losses to buildings and public property were estimated at Rs 172 crores. ¹

Build-up and progress

Warning messages were flashed by the Cyclone Warning Centre (CWC) in Visakhapatnam on November 14 during the cyclone's deep depression stage, which intensified into a cyclonic storm on November 15. Till November 16, 0530 IST, it had travelled in a westerly direction, after which it changed its course to the north till it located itself east of the Palk Strait. By 1700 hrs IST, it intensified into a severe cyclonic storm (SCS), and was located at latitude 7 degrees North and longitude 85. 5 degrees East about 900 km southeast of Madras (now Chennai).

After midday of November 17, it changed direction to the northwest. It was an SCS with core hurricane winds at a distance of 520 km southeast of Madras at 1515 hrs, and was centred at 0830 hrs on November 18 about 270 km east-southeast of Madras. Its position at 1230 hrs was 235 km southeast of Madras heading in a northwesterly direction, and was expected to cross the coast between Madras and Machilipatnam on November 19 morning. Heavy rainfall was predicted in the five southern coastal districts; windspeeds were estimated at 140 kmph commencing November 18 night, and tidal waves of 3m above normal tide level were predicted for Nellore, Prakasam and Guntur districts. In accordance with the CDMC report, people were advised to take precautions and to listen to the AIR broadcasts.

By 0715 hrs on November 19, the intensity of the formation was reduced to that of a cyclonic storm. It was then centred 165 km southeast of Machilipatnam, moving northwesterly and due to cross the coast between Ongole and Machilipatnam. Heavy rainfall was predicted for Nellore, Prakasam, Guntur, Krishna, and East and West Godavari districts by the afternoon. Windspeed was expected to go up to 100 kmph, and tidal waves 1-1. 5 m above normal tide were predicted for Prakasam, Guntur, Krishna and West Godavari districts.

¹ Account given by the Chief Minister to the Members of the House

At 1030 hrs, the situation was more or less the same but the storm had reached to 120 km south of Machilipatnam. (In a message to this effect that originated at 1325 hrs and was received at 1405 hrs, it was mentioned that tidal waves of 2m above the normal tide level were likely in Prakasam, Guntur, Krishna, West Godavari and East Godavari).

The next message originated at 0120 hrs on November 20, and was received at 0135 hrs: it mentioned that the storm crossed the coast near Chirala at 1730 hrs on November 19. It came 12 hours after the previous message. No message was forthcoming in the afternoon and night of November 19, or on the midnight of November 19-20. This hiatus is inexplicable, considering that the previous messages were being sent at far more frequent intervals.

Translation speed

The cyclonic system gathered speed the closer it got to landfall. Between messages no 1 and no 3, the distance the cyclonic system travelled was 35 km in 4 hours (0830-1230 hrs), a speed of 8.75 kmph. Between messages no 3 and no 4, the distance it travelled was 40 km in 8 hours (1230 hrs-2030 hrs), a speed of 5 kmph. Between messages no 4 and no 5, it travelled 25 km in 11 hours (2030 hrs-0715 hrs), a speed of 2.2 kmph. Between messages no 5 and no 6, it travelled 45 km in 3 hours (0715 hrs and 1030 hrs), a speed of 15 kmph. In the next 7 hours (1030 hrs-1730 hrs), during which it crossed the coast in daytime, it travelled a distance of 120 km at 17 kmph.

The warning for the tidal wave was given beginning with the message that originated at 1655 hrs on November 18 and through to the message that originated at 1325 hrs on November 19.

Comments

- 1) The CWC could have sent a message at about 1330 hrs, when the storm would have been about 70 km (judging from its recorded speed) from the coast. This message should have been received on the wireless around 1430 hrs, informing officials of the certainty of the storm crossing close to Divi Seema. Instead, the message (Warning Bulletin No 7) was initiated at 0120 hrs on November 20. It reached the Chief Secretary at 0135 hrs on November 20.

- 2) It was observed that the messages were received between 15 to 42 minutes after their having been handed in at the telegraph office – which goes to show that the speed of transmission was more than adequate.
- 3) The problem was that the storm did not move at a steady speed, although it did maintain a general direction. Its speed increased as it approached the coast.
- 4) It would have been useful to have given out the latitude and longitude of the storm observations, which could have helped the Control Room staff to plot them on a map and keep an ongoing check on the progress of the cyclone. The messages to Machilipatnam port did, however, include latitude and longitude positions.
- 5) The long gap following bulletin no 6 is a matter of concern. The state government had been informed over the telephone at 4 pm that the cyclone had started crossing the coast at Vetapalem at 2. 30 pm on November 19. This suggests that the CWC had, as a matter of routine, given out the next set of observations as the position at 2. 30 pm.

Just taking the pains to calculate the distance covered between the position noted at 7. 15 am and that at 10. 30 am would have indicated clearly that the speed of the cyclone had increased from 2. 2 kmph to 15 kmph. This single fact should have prompted the CWC to reduce the interval between observations and study the storm's position at 1200 hrs. Warning bulletin no 7 stated that the cyclone had crossed near Chirala at 17. 30 hrs. If that telephonic message was correct, the storm had obviously moved 120 km in 4 hours, at a speed of 30 kmph – double its speed evident at the observation at 10. 30 am.

The phenomenon of a cyclone increasing speed the closer it approached landfall from about 200 km was also evident in the November 1997 cyclone, and in some other cyclones. But perhaps the inconstancy of the phenomenon's occurrence deters from predicting a cyclone's strike time on every occasion.

Storm surge

The storm surge that accompanied the winds was between 9-20 feet (3-6m) high, 50 miles (80 km) long and penetrated inland up

The inconstancy of a cyclone speeding up as it approaches landfall from 200 km prevents prediction of its strike time on every occasion.

to 15 miles (24 km). While Krishna and Guntur districts felt the brunt, the adjoining districts were also seriously affected. In Krishna district, Divi and Bandar talukas came under the sledgehammer.

Divi ("island" in Telugu) is a triangular piece of land wedged between two branches of the Krishna river, with the Bay of Bengal bordering it on the east. It is flat with no point rising above 25 feet (8m). Much of Bandar mandal is low-lying and much of Machilipatnam, located in Bandar, is below sea level. The tidal creeks extend up to 8 miles (13 km) from the coast. A perusal of the maps of the area of the 1930s indicates that 15-25 square miles (24-40 sq km) stretch of dense mangrove forest has since disappeared due to new settlements and through neglect. The mangroves would have absorbed the impact of the storm surge to some extent.

The surge was accompanied by gale winds up to 200 kmph that caused as much damage as the surge which washed away at least 20 villages and engulfed 50 others in an area of 350 sq miles (560 sq km). The great speed of the surge overtook fleeing humans, catching them by surprise, as it were. Only those who clambered on to the rooftops of their thatched huts had a breather, but only for a while: the surge bore down on entire houses, breaking them down and snatching away the roofs along with the people on them. Few people survived the onslaught.

Some of the much-vaunted and socially upmarket cement concrete houses also collapsed, their walls burying people under them. Some were caught between their walls, with no avenues of escape, they drowned.

Response

The entire state administrative machinery was activated and the army was put on alert on the night of November 18. On the afternoon of the next day, the districts started reporting in heavy gales. The CWC had informed that by 1600 hrs on that day, the cyclone had started to cross Vetapalem in Prakasam district at 1430 hrs. (This fact has been deliberately included here to emphasise that, as mentioned before, there is a distinct element of doubt about the actual time of crossing. Unfortunately, the records available do not throw light on why this should have been so.).

By 1730 hrs, the District Administration's telephone connections with Guntur, Krishna and West Godavari had snapped. The police wireless sets, however, were kept open throughout the night. Even then, the government had no knowledge of the damage till the morning of November 20. The nature and extent of damage, in fact, were not known even till the evening of the same day. The weather was too inclement to have permitted an aerial survey of the area. Furthermore, Gannavaram airport at Vijayawada was out of communication.

The Indian Air Force (IAF) could only fly on the morning of November 21, when the Chief Minister, accompanied by the Chief Secretary, some ministers, senior officials, the Sub Area Commander, and the Station Commander of the IAF carried out an aerial survey. It confirmed that the assistance of the army was imperative in order to re-establish communications.

The army dispatched wireless sets the same night to the affected areas. The Air Force placed two helicopters under the command of the District Collector of Krishna district and under the District Collector of Guntur district.

Subsequently, additional resources of transport, medical teams, water tankers, jerrycans, and communications equipment were requisitioned from the army:

- 55 vehicles; three collapsible boats with outboard motors and crew for Krishna
- 20 medical teams for Avanigadda
- Water tankers and portable canvas water containers and 18 water-point detachments for Divi area
- 250 Jerrycans and microwave equipment for Avanigadda (on November 29)
- Speech communications between Avanigadda and Vijayawada, and Guntur and Bapatla
- Additional jerrycans and water-trailers for Krishna district

The Chief Minister took special pains to inform the Members of the House that this assistance provided was over and above the resources of the government. In the heated aftermath of the

disaster, the popular belief was that, for reasons known only to the powers that be, the resources of the army were left deliberately unused.

Senior officers were deputed to Krishna, Guntur, West and East Godavari districts to direct the rescue and relief operations. Jeeps and lorries were sent in from the neighbouring districts, the Forest Department rushed bamboos and palmyrah leaves to aid in building huts, 15 truckloads of asbestos sheets were made available. The Air Force deployed four helicopters, one Dakota (DC-3) and one Avro aircraft.

An epidemic was averted largely due to the deployment of 164 mobile teams, each consisting of one medical officer and three paramedics; 300 Health Inspectors were sent from Hyderabad and other districts; medicines and drugs worth Rs 64 lakhs were utilised; and anti-cholera inoculations were given to 4,014,554 people. Rs 175 lakhs was released for providing relief to the affected fishermen.

It was helpful to have police personnel, convicts from the Central Jail at Rajahmundry, and voluntary organisations engage in the task of disposing dead bodies and animal carcasses.

DEATHS AND PROPERTY LOSSES – NOVEMBER 1977

District	Deaths	Public property (in Rs crores)
Krishna	8,033	
Guntur	1,759	
Prakasham	48	
West Godavari	30	172
East Godavari	44	
Visakhapatnam	17	
Srikakulam	2	
Khammam	8	
TOTAL	9,941	

(Sources: Statement on Cyclone and Tidal Wave on November 19, 1977, by the Chief Minister of Andhra Pradesh, Central Press, Hyderabad, and The Andhra Cyclone of 1977 by Stephen P Cohen, C V Raghavulu, Vikas Publishing House Pvt Ltd, 1979)

Immediate relief extended to the victims was to the tune of Rs 17. 39 crores. The Central government was requested for about Rs 1,000 crores. Based on the assessment of their own officers, the Government of India provided Rs 56. 52 crores towards restoration and rehabilitation. An additional amount of Rs 3. 11 crores was given by the Government of India towards tobacco barns and assistance to small and marginal farmers. In response to the state government's request for further assistance of Rs 16. 77 crores, the Central government sanctioned Rs. 11. 46 crores.

MAY 1979

On May 12, 1979, a severe storm with a core of hurricane winds crossed the coast near Kavali (Nellore district) and tore into the districts of Nellore and Prakasam. It also affected Guntur, Krishna, West Godavari, Kurnool, Cuddapah, Mahboobnagar and Rangareddy districts.

Build-up

The cyclone started as a depression on May 11 at latitude 12 degrees north and longitude 89 degrees east advancing due west, and was located about 600 km east of Sri Lanka. It became a cyclone on May 7 at 0900 hrs IST and intensified into a severe cyclonic storm by 1200 hrs. The next day at 0900 hrs, it was located about 400 km east of Sri Lanka. By 1200 hrs on May 10, it was 500 km southeast of Madras heading in a northwesterly direction. It was expected to strike the coast between Madras and Nellore by the evening or night of May 11. Windspeeds were estimated to be around 100 kmph, enough to cause extensive damages in Nellore, Prakasam, Guntur and Krishna districts.

Even as the next warning bulletin located the cyclone at 400 km southeast of Madras, gale windspeeds were expected to be 120 kmph. The cyclone did not cross the coast as predicted, but lay about 100 km off the coast at 0300 hrs on May 12. At noon that day, the meteorological station at Secunderabad informed that the storm was in the process of crossing the coast beginning 1130 hrs between Nellore and Kavali. At 1450 hrs, the flash from the CWC gave the same message, along with a warning of a tidal wave 3-4m above the normal tide level, windspeed at 140 kmph, widespread damages to houses, and disruption to communications.

Instead of crossing it, however, the cyclone proceeded along the coast, weakening a little, for 80 km. It relocated to Ongole, about 100 km west of Machilipatnam, and turned further west, downgrading itself to cyclone intensity, and dissipated by May 14.

The difference that marked this cyclone from that of November 1977 was that deaths due to storm surge were prevented as officials promptly evacuated people from low-lying areas. There were deaths, however, due to drowning and collapse of houses. The stormfront was wide and caused damage to the adjacent districts of Krishna, West Godavari and East Godavari to the right of its path, and the districts of Cuddapah, Kurnool and Mahboobnagar to the left. Because of the size of the cyclone and the effect of the heavy rains that accompanied it, several chains of tanks were breached. This further aggravated the surging waters and the rivers passing through Prakasam district overflowed and washed away village huts, killing people and livestock and wrecking property on an extensive scale.

Some areas in Prakasam and Mahbubnagar received very heavy rainfall in a very short period. Divi taluka escaped the brunt of the wrath because of the raising of its tidal bank from 9 to 16 feet (3 to 5m) after the 1977 cyclone, even though the tidal wave this time was a bit over 3m high. However, the slope of the tidal bank facing the sea was heavily eroded. Due to unusually high floods, substantial acreage was sand-cast and many villages were marooned. Traffic, power supply and communications were totally disrupted, and helicopters had to be used to airdrop food packets, water canisters, medicines, etc.

The heavy, slashing rains extensively damaged the districts on the western side of the cyclone's path.

The losses of human lives and crops together with the value of the losses and the amount spent on relief measures is given in the table. (*Refer 'Loss of Human Life, Relief Measures, Crop Loss' on Page 36*)

Relief measures undertaken were according to the government orders then in force, largely similar to those followed during the cyclone of November 1977. They were:

LOSS OF HUMAN LIFE, RELIEF MEASURES, CROP LOSSES

District	Deaths Value	Houses damaged (lakhs)	Relief		Crop damage (Rs in lakhs)
			(Rs in lakhs)	(in ha)	
East Godavari	1		0.010	18,292	229.72
West Godavari		0.002	0.12	10,602	64.20
Krishna				10,461	52.10
Guntur	16	0.10	5.83	3,030	229.36
Prakasham	512	2.91	395.00	6,721	177.28
Nellore	79	2.66	403.89	20,437	1,171.00
Kurnool	12	0.065	5.02	709	27.18
Cuddapah	3	0.137	1.096	2,365	213.08
Mahboobnagar	11	0.21	21.00	26	05.
Chittoor	4				
TOTAL	638	6.094	833.116	72,643	2,164.42

(Source: Note on the Recent Cyclone of May 1979, Dr M Channa Reddy, Chief Minister of AP)

- 1) *Ex-gratia* payment of Rs 1,000 for family of each dead person, excluding children below 5 years of age, irrespective of the number of persons dead or whether they were earning members or not. The government also waived the income limits of eligibility for the payment of cash relief
- 2) Payment of Rs 150 per house fully damaged, and Rs 75 per house partially damaged
- 3) Distribution of free clothing consisting of one pair of *dhotis*, a sari, and a cotton blanket costing about Rs 50 for all those whose houses were damaged
- 4) 10 kg of rice per family
- 5) For the rejuvenation of crops, a subsidy of 25 per cent for small farmers and 33.3 per cent for marginal farmers, and loans sanctioned by cooperative banks, scheduled banks and the Agriculture Department
- 6) Payment of Rs 150 as assistance towards repairs of looms for each weaver affected, besides yarn worth Rs 100 on 50 per cent loan and 50 per cent subsidy basis

- 7) Fishermen reimbursed for their losses on 50 per cent loan and 50 per cent subsidy basis
- 8) A sum of Rs 10 lakhs to be kept at the disposal of the Backward Classes Corporation towards subsidy to be granted to artisans over and above the margin money and other subsidies, if any, given by the Corporation, subject to a maximum of Rs 200 per case
- 9) Postponement of collection of land revenue, etc

The government released a sum of Rs 10.75 crores for restoration works by the Irrigation Department towards irrigation, drainage, tidal banks, restoration of roads and buildings, repairs to government buildings, medical relief and health, and for the Panchayati Raj Department. The state government sought assistance from the Central government of Rs 180 crores.

NOVEMBER 1984

This cyclone started in the Bay of Bengal east of Kanyakumari, on the morning of November 8, 1984, as a low pressure area. By the evening of November 9, it became a deep depression with its centre at latitude 9.5 degrees north and longitude 87 degrees east. Moving west-northwest, it turned into a cyclone on November 11 morning and was located at latitude 10.5 degrees north and longitude 82 degrees east. It intensified into a severe cyclonic storm by the same evening at latitude 11.3 degrees north and longitude 81.2 degrees east.

Moving north-northwest, it developed an inner core of hurricane winds by the morning of November 12, with its centre at 12 degrees north and longitude 80.8 degrees east, and was 140 km southeast of Madras with a forecast of a tidal wave of up to 4m with a windspeed of 150 kmph. At about 21.30 hrs the same night, it was located 45 km southeast of Madras, with the windspeed increased to between 160-180 kmph.

It later moved slowly in a northwesterly direction. On the morning of November 13, it was about 75 km northeast of Madras. Moving very slowly towards the coast, it lay centred close to the coast (about 50 km southeast of Nellore) on November 14 at 1230 hrs with windspeeds estimated at 180-200

kmph and tidal wave at 3-4m above the normal tide level. It crossed the Nellore coast north of Sriharikota on the afternoon of the same day, weakened into a deep depression, and lay centred in the evening at about 50 km south of Nellore. It rapidly dissipated during the night into a low-pressure area and by November 15 morning, it further dissipated into a trough of low pressure over South Andhra Pradesh and the adjoining parts of Tamil Nadu.

Reports say that Sriharikota experienced gale winds of 100-150 kmph from November 13 morning, which increased to 120 kmph and then went suddenly upto 180 kmph by the noon of the same day. By the morning of November 14, the winds were of the order of 100-150 kmph at Sriharikota. At Gudur, the railway authorities reported a windspeed of 100 kmph on the afternoon of November 13.

The cyclone was stationary for almost a day from November 13 to 12.30 pm on November 14, and was about 50 km southeast of Nellore. It touched the coast of Nellore near Dugarajapatnam in Vakadu taluka. After crossing the coast, it started weakening rapidly and became a deep depression. Heavy rains continued in Nellore district up to November 18. Rains also affected the adjoining districts of Chittoor and Cuddapah.

Largescale devastation was caused in five talukas of Nellore and three talukas of Chittoor. Many areas of Nellore and Chittoor became inaccessible. First reports sent to the Central government said that 1,300 villages were affected, with 575 people dead. The villagers lost 26,346 cattle and 64,304 sheep and poultry. Standing crops of 210,000 ha of dry and wetlands were damaged, of which 3,000 ha were sand-cast. Houses damaged were estimated at 320,000.

All the rivers and streams were in spate and extensive areas were inundated. Gudur, Vakadu and Sulerpet talukas were greatly affected. Initially, inundation was limited to the western side of the National Highway. But as the water began receding from there, its level increased on the eastern side. The Swarnamukhi river was in spate and over 2,000 sq km turned into a rolling sheet of water. Embankments and minor irrigation tanks in both Nellore and Chittoor were breached. State, district and Panchayat

roads were extensively damaged by the floodwaters. Telecommunications in the districts broke down, with only District Headquarters remaining in communication with the State Headquarters.

The District Headquarters took action according to the existing Contingency Plan to warn the public and evacuate 150,000 people. 200 relief camps were organised, with shelter given to 120,000 people.

The major losses and damages suffered and the affected districts are given below:

LOSS OF HUMAN LIFE, CATTLE AND PROPERTIES

Type of loss	Nellore	Chittoor	Prakasham	Cuddapah	Total
Human deaths	527	45	1	2	575
Cattle loss	18,389	7,957			26,346
Other animals	59,794	4,510			64,304
Crop loss (in lakh ha)	1.49	0.46	0.12		2.07
Value of crops (in millions)	647.8	200.0	52.2		900.0
Houses damaged	250,000	64,901	409	5,500	320,000
Value of infrastructure (in millions)	464.7	175.5	5.6	4.5	650.9

(Source: Memorandum on Cyclone and Heavy Rains in Andhra Pradesh, November 1984, Revenue Department Government of AP)

The state government initiated relief measures according to the orders then in force, which were expected to cost Rs 110 million. The agricultural loss compensation to the farmers totalled Rs 52.11 million. Restoration of communications was given top priority and Rs 50 million was released to Public Works Irrigation, Roads and Building Departments and Panchayat bodies. National Highway 5 was restored on November 21, 1984.

The Forest Department provided construction material worth Rs 86 million. The Medical and Health Department required Rs 3 million, and the Animal Husbandry Department Rs 16.93 million for the replacement of lost animals, drugs, vaccines, fodder, etc.

Compensation to weavers was Rs 13.54 million, while fishermen were given Rs 21.3 million.

As part of rehabilitation, 125,000 houses costing Rs 28.125 million were planned. There was expenditure on other rehabilitation and restoration works undertaken by various sectoral departments.

The brief, broad break-up is given below:

1) Relief Work	Rs 66.904 million
2) Rehabilitation	Rs 230.799 million
3) Repair and Restoration Public Utilities	Rs 651.290 million
TOTAL	Rs 948.993 million

In terms of proportion, the estimated losses as a percentage of the total were:

1) Relief	7.05 per cent
2) Rehabilitation	24.32 per cent
3) Repair and Restoration	68.63 per cent

Comment

It is a historical fact and a matter of outstanding concern that Nellore district has been taking the brunt of cyclones at regular intervals.

It is a historical fact and a matter of outstanding concern that Nellore district has been taking the brunt of cyclones at regular intervals. From 1892 to 1998, it has faced 20 cyclones of varying intensities (averaging one cyclone every six years). Infrastructural damage and loss is in greater part a result of aggravation due to the extreme pressures and stress during cyclones. High windspeeds are helped in their task by rampant structural weaknesses because of, deleterious planning and design, bad quality of construction materials as well as poor workmanship. Past experience, particularly the ruinous 1977 cyclone, should have suggested that the strengthening of infrastructure should be of cardinal priority. But even today, this is not an aspect that seems to occupy the minds of the decision-makers.

1985: A triangle of cyclones

Three cyclones occurred in 1985, the first in October affecting Visakhapatnam and East Godavari, in which five people were injured. The second cyclone threatened Nellore and Prakasam districts, failing to cross but clipping them and leading to

damages from heavy rains. The third cyclone that started on December 13 crossed near Sriharikota in Nellore district at 0530 hrs the next day, causing 16 deaths and property losses.

The total losses in the three cyclones, which affected seven districts, 16 people dead, 3,196 houses damaged, 1.06 lakh ha crop area ravaged, leading to an expenditure of Rs 24.26 crores.

Comments

Once again, statistics clearly show that the damages/losses and the consequent projections are dominated by the financial support required for repairs to the infrastructure sector.

1) Relief	Rs 17.203 million	0.913 per cent
2) Rehabilitation	Rs 8.030 million	21.656 per cent
3) Repairs and restoration	Rs 1,458.890 million	77.431 per cent

OCTOBER AND NOVEMBER 1987

October 15-16, 1987

On October 15, the CWC had informed that a cyclone which lay centred about 350 km east-southeast of Ongole was moving in a west-northwesterly direction and was likely to intensify. On the same day, it issued a second warning at 2200 hrs that the cyclone was about 180 km east-southeast of Ongole and was likely to cross Ongole on the night of October 15 or early next morning.

It also warned of tidal waves at Prakasam, Guntur and Krishna districts with windspeeds reaching 80-100 kmph. The cyclone had crossed the coast between Bapatla and Ongole and lay centred 50 km north of Ongole at 0730 hours on October 16.

The main effect of the cyclone was felt in the districts of Prakasam, Guntur, and Krishna. There was a flurry in the northern districts of Srikakulam, Vizianagaram, Visakhapatnam and East Godavari when some people lost their lives and a few houses were damaged.

The villages affected in the three districts were 157, the total population affected was 617,566, and those evacuated numbered

44,855. Fatalities were limited to 22 and 10,213 houses were damaged. (The infrastructure loss for this cyclone has been included among the two subsequent cyclones and will be commented upon later.).

November 3-5, 1987

This cyclone first announced its presence on October 31, about 800 km southeast of Machilipatnam. On November 1, it was noticed at about 400 km south of Machilipatnam and was expected to cross between Nellore and Kakinada with gale windspeeds of 80-100 kmph, affecting all the six southern districts. By 0830 hours on November 2, it had edged closer, gathering strength about 240 km east-southeast of Nellore. It was expected to cross that very day between Nellore and Madras fronted by tidal waves 1-1.5m above the normal tide level and likely to inundate the low-lying areas of Nellore and Prakasam. Windspeeds of 90-100 kmph could disrupt communications, damage *pucca* houses, and uproot trees in the four southern districts. There was also warning of heavy rains in the three northern districts. Then, at 1730 hrs, the cyclone moved closer, to about 170 km southeast of Nellore.

The cyclone made landfall some time during the night or early hours of November 3 and was located 60 km northwest of Nellore at dawn at 0530 hours. The cyclone affected 856 villages with a population of 1,509,783, and 25,105 people were evacuated. The human lives lost numbered 55 and 87,232 houses were damaged.

The rains also affected Cuddapah, Mahbubnagar and Nalgonda districts, with some deaths and damage to houses. In Nellore district, 24 people died, along with many heads of cattle lost; 15,000 houses collapsed and four times that number suffered partial damage. The Electricity Board incurred extensive losses and other infrastructure destruction was substantial. Prakasam district had 14 deaths, with 5,500 houses entirely damaged. The National Highway was blocked due to breaches and was restored to traffic on November 3. Other districts right up to Srikakulam incurred damages, but of a lesser order. (Further details will be covered in the comprehensive summary after the narration of the almost concurrent cyclone on November 12-14, 1987).

November 12-14, 1987

On the midnight of November 11, with the region still recovering from the impact of the November 3-5 storm, another cyclone was located about 600 km east-southeast of Machilipatnam. Moving in a west-northwesterly direction, it was expected to cross the coast between Ongole and Kakinada. With windspeeds estimated to be between 80-100 km, all the coastal districts were warned. By midday of November 12, the cyclone's location was at 300 km southeast of Machilipatnam, with gale winds of 100 kmph and tidal waves between 1-1.5m. By 2300 hrs, windspeeds of 100-120 kmph were predicted, and the cyclone was about 200 km off the coast. The next bulletin indicated that it had crossed the coast and was lying close to Machilipatnam, but weakening.

The cyclone affected 397 villages, and of a population of 1,077,083, those evacuated numbered 688,545. The deaths were 42

**CYCLONES OF OCTOBER 15-16, NOVEMBER 3-5 AND
NOVEMBER 12-14, 1987 (Rs in lakhs)**

1)	Relief	Rs 79.15		
2)	Rehabilitation	Rs 1,011.62	Total 1) + 2)	Rs 10.9077 crores
3)	Municipalities	Rs 955.00		
4)	Fisheries sector	Rs 58.16		
5)	Forest	Rs 40.00		
6)	Industries	Rs 164.00		
7)	Animal husbandry	Rs 38.20		
8)	Agriculture	Rs 786.00		
9)	Horticulture	Rs 99.19		
10)	Rural Water Supply	Rs 11.44		
11)	Cooperation sector	Rs 1,089.74		
12)	Electrical sector	Rs 1,236.59		
13)	Irrigation sector	Rs 1,293.46		
14)	Roads (PWD)	Rs 2,147.54		
15)	Drains sector	Rs 971.00		
16)	Panchayati Raj sector	Rs 3,780.00		
17)	Handlooms sector	Rs 6.00		
18)	Medical and Public Health	Rs 5.00	Total 3) to 18)	Rs 115.58 crores
TOTAL		Rs 12648.77		Rs 126.48 crores

(Source: Memorandum on Cyclones and Heavy Rains in October and November 1987 in Andhra Pradesh, Revenue Department, Government of AP)

and 13,108 houses were damaged. In all three cyclones, 119 died and 110,553 houses were damaged. The crop area affected was 9.61 lakh ha.

The added losses were Rs 126.48 crores, including damage to properties worth Rs 115.58 crores. Relief and rehabilitation measures amounted to Rs 10.9077 crores. The details for the three cyclones are given in the table (*Cyclones of October 15-16, November 3-5 and November 12- 14*).

The most obvious reference from the list above is that the losses were primarily in various sectoral departments and accounted for 91.38 per cent of the total loss estimates.

NOVEMBER 1989

This was a long distance, peripatetic cyclone that originated 1,000 km southeast of Visakhapatnam. The forecast had indicated a severe cyclonic storm with core hurricane winds and was expected to hit the AP coast between Nellore and Kakinada on the night of November 8 with windspeeds increasing from 140-160 kmph to 220-240 kmph. Widespread damages were predicted in Nellore, Prakasam, Guntur, Krishna and East and West Godavari districts. Storm surge upto 6 m above the normal tide level, and the inundation of low-lying areas were expected.

The storm was expected to move in a west-northwesterly direction, and to cross between Ongole and Machilipatnam at 1300 hrs on November 8. It actually hit the coast between Kavali and Ramayapatnam on the night of November 8-9. The crossover was on the border between Nellore and Prakasam districts.

Relief measures

The state government released Rs 689.43 lakhs in the form of *exgratia* payment, evacuation costs and other relief measures as per state norms. The damages were 69 dead, 63,230 fully demolished houses and 85,882 partially damaged houses, 7,117 animals killed and 62,380 acres of crops damaged. Departmental losses and measures geared towards improvement amounted to Rs 1,299.48 lakhs.

Restoration and reconstruction costs once again proved to be in the forefront of expenditure, with an estimated requirement of

Rs 2,093.46 lakhs – 51.28 per cent of the total expenditure of Rs 4,082.37 lakhs.

MAY 1990

The cyclonic storm developed on May 5 at latitude 10 degrees north and longitude 84.5 degrees east 600 km southeast of Madras. The cyclone became a deep depression at 0530 hours the same day and was centred at latitude 10 degrees north and longitude 85.7 east.

It moved westwards sluggishly till the evening of May 6 and intensified into a severe cyclonic storm with a core of hurricane winds. It moved in the west-northwesterly direction till May 7 and, in the course of time, became a severe cyclonic storm. Thereafter, it changed its course to a north-northwesterly direction and crossed the coast on the evening of May 9 at about 1925 hrs.

After having travelled over the sea for five days, landfall was expected between Nellore and Nagapatnam. However, it subsequently changed its course, moving in a northerly direction, and crossed the coast at the mouth of the Krishna river.

Comparison with 1977

This storm was more severe than the 1977 cyclone, both in extent and intensity. That the storm was very intense was indicated by the National Ocean and Atmospheric Agency (NOAA) satellite picture: its severity was T6-T6.5, which made it deadlier than the 1977 cyclone. The windspeeds were estimated to be 220-250 kmph.

The satellite echo of the 1990 storm was also much wider than the one in 1977. Both storms had travelled for five days over the sea. The 1977 cyclone had originated in the lower latitude region of 7.5 degrees north and 90 degrees east whereas the 1990 cyclone formed at 10 degrees north and 84.5 degrees east. The track of the 1977 storm was longer by about 400 km compared to the path of the 1990 cyclone. Both moved initially in a westerly direction, and then intensified and moved northwards. Although both were of a severe nature, they showed signs of weakening before landfall, more or less in the same area.

The Chief Minister had been reviewing the situation from May 6 onwards and had several preliminary meetings with all concerned officers of the various departments. Wide publicity was given to the approach of the cyclone through the media, and about the arrangements made, and people living in the dangerous zones were advised to relocate. The Chief Minister assigned specific districts to ministers for personal supervision. They were told to make on-the-spot decisions.

The Control Room was equipped with "ham" radios and police wireless, and so was in a position to receive detailed information from the threatened districts. The Collectors were authorised to draw funds from the state treasury to meet any emergency. They were also advised to secure the assistance of voluntary agencies and other public bodies that offered to help. Senior officers were sent to the districts.

Since the nature of the storm had been identified as a severe cyclonic storm, the Air Force and the navy were put on alert. Thus, when the cyclone struck on May 9, and news came in that many villages had been marooned, the Air Force and the navy responded immediately. More than 600,000 milk packets, and food and water, were airdropped over a period of 10 days by 11 helicopters provided by the Air Force and the Navy.

Due to the size and intensity of the cyclone, there were heavy rains in the coastal areas from May 1 onwards as shown in the table below.

AVERAGE RAINFALL IN AP (May 1-May 13, 1990)

Region	Normal rainfall for May	Actual rainfall
Coastal Andhra	53	366
Rayalaseema	51	67
Telangana	27	133
State of Andhra Pradesh	41	213

(Source: Government of AP Cyclone Reconstruction Project 1990)

A look at the table indicates that the coastal region received 690 per cent of the monthly average, the Telangana region received 492 per cent, followed by Rayalaseema at 131 per cent. The cause of major damages is evident. Furthermore, due to the heavy

rains, the rivers in the affected areas received excess water as shown in table below.

RIVER DISCHARGES			
(c/s – cusecs)			
River affected	Safe discharge	Discharge obtained	Area (in acres)
Vamsadhara	1,00,000 c/s	1,20,000 c/s	10,000
Nagavali	1,46,000 c/s	2,44,000 c/s	30,000
Sarada	55,000 c/s	1,50,000 c/s	70,000
Thandava	40,000 c/s	1,00,000 c/s	20,000
Pumpa	50,000 c/s	1,00,000 c/s	10,000
Yeleru	75,000 c/s	1,50,000 c/s	70,000
Budemuru	24,000 c/s	32,273 c/s	64,000
Nallamada	14,460 c/s	16,000 c/s	1,000

(Source: Government of AP Cyclone Reconstruction Project 1990)

Early warning and information regarding the cyclone made it possible for adequate precautions to be taken to convince people to relocate to safer places. The evacuation took place on a war footing: 2,019 teams used 745 vehicles to evacuate 651,865 people from 546 villages to 1,098 relief camps. Deaths were thus restricted to 967, a remarkable achievement considering that 10,000 lives had been lost in the 1977 cyclone.

The cyclonic storm and the accompanying rain affected 10 districts, causing colossal damage to public and private properties. Those districts that providentially escaped the direct fury of the storm were battered by very heavy rain, flashfloods and landslides in the interior and the tribal areas, affecting a population of 77.81 lakhs in 5,160 villages. Krishna and Guntur districts were the worst hit districts.

Relief measures

Exhaustive enumeration revealed that 659,520 houses were fully damaged and 780,139 were partially damaged. Prakasam district,

with the second lowest rainfall, had as many as 79,878 houses damaged. Nellore district to the south had only 1,369 houses damaged.

A total sum of Rs 1,728.232 lakhs was paid as compensation. As part of relief measures 1,211,623 families were given 20 kg rice per family which cost Rs 961.834 lakhs. Clothes and utensils came to Rs 400.083 lakhs. In all the relief burden was Rs 8,799.42 lakhs.

WEAKER SECTION HOUSES DAMAGED

District	Houses constructed	Houses damaged	Partly	Total
Krishna	38,204	1,611	0	1,611
Guntur	45,153	1,244	0	1,244
West Godavari	53,810	7,373	0	7,373
East Godavari	77,393	7,065	217	7,282
Visakhapatnam	66,108	5,200	1,200	6,400
Vizianagaram	36,224	2,400	4,800	7,200
Khamman	48,637	2,520	28	2,548
TOTAL	365,529	27,413	6,245	33,658

(Source: Cyclone Reconstruction Project submitted to the World Bank by the Government of AP 1990)

The total number of houses constructed under this scheme till May 31, 1990 were 1,171,092, costing Rs 64,128.11 lakhs and a balance of 1,86,530 remain to be constructed.

Damages to existing houses was from the tiles being blown away by the force of the storm, seepage of water into the basements, unplastered walls damaged by rain, flooding and so on. In colonies under construction, damage was caused by the coagulation of cement, the washing away of sand, bricks, metal, etc, and the collapsing of partly constructed walls. There were

also damages to public amenities provided in colonies like roads, drains, water supply, etc. The total damages amounted to Rs 740.32 lakhs.

The state's road network and the National Highway were disrupted between Vijayawada and Chilkalurupeta in Guntur district. Floodwaters overflowed the road from Budameru and Ramaleru between Vijayawada and Hanuman Junction and the causeway collapsed in the same section in Krishna district. Tammileru in West Godavari district was flooded, the Pampa river near Annavaram overflowed onto roadways between Rajahmundry and Tuni, as did the Tandava river near Tuni. In Visakhapatnam district, breaches occurred due to the bloating of the Sarada river. In Vizianagaram district, the National Highway was affected by the collapse of the bridge and the overflowing of water on the causeway near Manapuram. In Srikakulam, National Highway 5 was cut off by the floodwaters of the Nagavali river.

DISTRICT-WISE DAMAGES TO ROADS

District	Road damaged (in km)
Nellore	564
Prakasam	468
Guntur	1,246
Krishna	1,350
West Godavari	1,009
East Godavari	1,587
Visakhapatnam	870
Vizianagaram	392
Srikakulam	433
TOTAL	7,919

(Source: Cyclone Reconstruction Project submitted to the World Bank by the Government of AP 1990)

The damaged sections add up to 7,919 km out of the total length of 16,681 km under the R&B Department. The proportion damaged works out to 47.5 per cent. The total length of roads in all the districts under the Panchayati Raj was 29,657 km, of which the damaged portions were 17,923 km, or 60.4 per cent. In the municipalities, the roads were damaged by rains and the stagnation of water for days on end, leading to extensive erosion. In the interior agency areas and the forest roads, damages occurred due to landslides and overflowing hill streams. The total damage to all the roads came to Rs 27,504 lakhs.

The problem with the state's extensive road network is that not many roads in the interior are pucca roads, which makes them vulnerable to heavy rains.

The problem with the state's extensive road network is that not many of the roads connecting the villages and the interior are pucca roads, which makes them very vulnerable to heavy rains. The extent of road damage restricted the approach to many villages even a week after the cyclone had crossed the coast.

The buildings of various government departments were damaged by gale winds of more than 200 kmph. Many government buildings with AC sheets and Mangalore-type tiles showed evidence of roof damage; in fact, even the buildings with RCC roofs were also damaged by floodwater inundation and storm surge. Woodwork and flooring were water-sogged and scoured. Most school buildings, community centres, and Panchayat buildings had impact and water damage, as did infrastructural facilities maintained by the local bodies in towns and villages. The total losses came to Rs 6,142 lakhs.

COMPREHENSIVE LOSS ACCOUNT

Districts affected	14
Human losses	967
Animal losses	5,170,301
(Poultry)	4,346,000
Houses damaged	1,439,659
Crop area affected	480,000 ha
TOTAL LOSS	Rs 224,776 lakhs

LIST OF DAMAGES PRESENTED TO THE WORLD BANK

Sectoral departments/sub-departments	Value (Rs in lakhs)
Damages to dwelling units	55,000
Food and Agricultural Department	
a) Agriculture	28,934
b) Horticulture	53,035
c) Marketing	186
d) Fisheries	2,034
e) Civil Supplies	741
f) Animal Husbandry	4,560
g) Warehousing	806
Irrigation Department	17,385
Panchayati Raj Department	24,600
Transport, Roads and Buildings Department	
a) Roads and Buildings	12,300
b) APSRTC	1,550
Forest, Energy and Environment Department	
a) Forest Department	2,498
b) APSEB	9,333
Industry Department	
a) General Department	4,187
b) Handlooms and Textiles	644
c) Sugar Factories	382
d) Sericulture	33
Social Welfare Department	
a) Social Welfare	2,015
b) SC Finance Corporation	127
c) Housing Corporation	740
Education Department	45
Fire Services	5
Housing and Municipal Administration Department	7,500
Medical and Health	323
TOTAL	224,776

(Source: Cyclone Reconstruction Project submitted to the World Bank by the Government of AP 1990)

LOSSES AS PER THE MEMORANDUM ON MAY 9 AND 10

Sectoral department/sub-sectoral department	Value (Rs in lakhs)
Agriculture	8,612
Horticulture	12,640
Roads and Buildings	
1. Roads	7,332
2. Buildings	400
National Highways	344
Panchayati Raj	18,406
Market yards	82
Civil Supplies	
1. Rice	579
2. Sugar	51
Irrigation	2,916
Godavari Delta System and Yeleru Project	1,000
APSRTC	1,550
Municipalities	3,665
TOTAL	57,577

(Source: Cyclone Reconstruction Project submitted to the World Bank by the Government of AP 1990)

OCTOBER 30 - NOVEMBER 3, 1994**Brief history**

On October 29, a depression formed about 600 km southeast of Madras. By the evening of the same day, it developed into a deep depression and was centred southeast of Nellore. The CWC at Visakhapatnam issued a cyclone alert.

The next day, All India Radio issued a cyclone alert at 0530 hrs, along with a heavy rainfall and gale warning with windspeeds of 60-70 kmph for Chittoor, Nellore, Prakasam, Guntur and Krishna districts. The storm progressed in a northwesterly direction and was positioned 122 km southeast of Madras at 2030 hrs the same day. At 0330 hrs on October 31, it was located 80 km southeast of Madras. It crossed the coast near Madras and progressed to 60 km southwest of Nellore by the evening. By 2130 hrs the same day, the storm had weakened into a deep depression at 100 km

northwest of Nellore, Gale winds deemed were no longer likely but heavy rains would continue. The depression was downgraded to a low-pressure area but the heavy rain warning for south coastal Andhra and East and West Godavari districts continued. The rains continued till November 3.

DISTRICT-WISE RAINFALL FROM OCTOBER 31-NOVEMBER 3, 1994

Districts	Average rainfall (in mm)	NE monsoon district normal	Percentage of normal
Nellore	253.1	586.0	43
Prakasam	290.1	317.0	91
Guntur	246.1	252.0	98
Krishna	277.0	325.0	117
West Godavari	217.0	260.0	83
East Godavari	269.0	326.0	83
Chittoor	66.4	410.0	16

(Source: Memorandum for Cyclone and Heavy Rains from October 31-November 3, 1994 in Andhra Pradesh, PR, RD and Relief Department, Government of AP)

A perusal of the district rainfall data shows that the average heaviest rainfall in a day – of 193.1 mm – was in Prakasam district, followed by Nellore at 160.2 mm.

The effect of the cyclone was felt in 1,951 villages of the seven districts mentioned above.

Deaths	172
Houses affected	79,220
Crop damage	3.97 lakh ha
Population affected	936,165

Relief operations

A total of 457 relief camps were organised and 76,017 families were evacuated.

RELIEF OPERATIONS (OCTOBER 31-NOVEMBER 3, 1994)

Effect /losses	Nellore	Prakasam	Guntur	Krishna	W Godavari	E Godavari	Chittoor
Mandals	20	19	9	10	23	12	
Villages	70	300	451	360	44	436	254
Population affected	52,000	30,000	0	41,478	762,000	48,101	2,586
Relief camps	33	45	214	105	3	57	0
Families evacuated	4,500	6,808	54,281	0	285	10,143	0
Houses (fully damaged)	205	4,225	9,803	1,281	307	0	491
Houses (partly damaged)	1,096	9,995	37,805	11,362	506	0	2,096
Deaths	46	32	54	31	5	1	3
Tanks/canals (damaged)	54	56	390	516	50	0	125
Crop damage (in ha)	1,310	58,104	180,420	29,650	31,323	91,481	21,736
Villages w/o Electricity	957	72	244	17	43	0	575
Sandcast (in ha)	200	3,000					129

(Source: Memorandum for Cyclone and Heavy Rains from October 31-November 3, 1994 in Andhra Pradesh, PR, RD and Relief Department, Government of AP)

The total expenditure on relief by the Collectors was Rs 1,285 lakhs. The state spent Rs 5,390 lakhs as "committed expenditure". The total damages estimated for the seven districts for 1994 was: 172 human losses, 512 animal losses, 79,220 houses damaged, and 397,000 ha crop area damaged. The total loss estimated was Rs 62,593.18 lakhs. The state government had requested the Government of India for assistance of Rs 21,471.46 lakhs for restoration works.

Restoration works

The state government requested the Central government for assistance worth Rs 21,471.46 lakhs for restoration works.

RESTORATION WORKS – AMOUNTS REQUESTED

Activity	Nellore	Praka- sam	Guntur	Krishna	West Godavari	East Godavari	Chittoor	Total
Irrigation	426.36	1030.20	530.00	770.17	272.80	202.31	21.54	3258.38
Agriculture	20.00	612.63	1422.93	684.33	229.86	745.11	-	3714.86
Fisheries	0.54	40.00	48.28	226.38	27.00	35.43	-	377.63
Panchayat Raj	343.00	651.39	1307.05	739.00	739.80	1421.85	139.50	5341.59
Roads and Buildings	446.00	739.00	506.21	610.00	334.00	1617.94	115.00	4368.15
Municipalities	172.50	287.64	1111.44	939.97	440.02	296.17	185.25	3432.99
Animal Husbandry	-	20.00	1.50	-	-	-	-	21.50
Medical and Health	9.50	13.50	13.50	13.50	4.50	-	0.86	55.36
APSE.B.	402.00	153.00	170.00	30.00	50.00	-	51.00	856.00
Social Welfare	-	50.00	-	-	-	-	-	50.00
TOTAL	1819.90	3597.36	5110.91	4013.35	2097.98	4318.81	513.15	21471.46

(Source : Memorandum for Cyclone and Heavy Rains from 31-10-1994 to 03-11-1994 in Andhra Pradesh. P. R. , R. D. and Relief Deptt. Government of AP)

Of the seven districts affected, Chittoor and Nellore suffered comparatively less damage. The bulk of the losses were in the infrastructural assets. The major losses are shown below:

Sectoral department	Rs (in lakhs)	Percentage of total
Irrigation	3,253.38	15.15
Agriculture	3,714.86	17.30
Panchayati Raj	5,341.59	24.56
Roads and Buildings	4,368.15	20.34
Municipalities	3,432.99	15.98

Structural damages to buildings in the Panchayati Raj Department and the Roads and Buildings Department were greater than those in the other departments. This was so in the previous cyclones as well and in the cyclones that followed. The inference that begs to be drawn is that most of the structures were too weak to sustain heavy rains.

JUNE 1996

1996 was a particularly bad year for the state: it ran into two cyclones and had three periods of heavy rains. Collectively, they caused massive damage.

The first disaster was the June cyclone. This system started on June 12 as a depression 600 km east of Karaikal. It progressed along the northwesterly direction and became a deep depression the next day, positioned at about 220 km east of Madras at 1200 hrs. Continuing in the same direction, it headed towards Nellore. During the night of June 13-14, it intensified into a cyclonic storm, and by 0300 hrs GMT lay very close to Nellore.

However, instead of crossing the coast, it looped north and east and at 1200 GMT was located east of Ongole about 100 km from the coast. It then travelled parallel to the coast and, at 0300 GMT on June 15, was located about 100 km southeast of Kakinada. It continued in a northeasterly direction and was located about 200 km southeast of Visakhapatnam at 1200 GMT. From here, it changed direction again and curved north and west toward Visakhapatnam, when it weakened into a depression and crossed the coast north of Visakhapatnam.

As a result of the cyclone's meandering, heavy rains were experienced in all the coastal districts, in Rayalaseema, and in a few districts of Telangana. People evacuated from the low-lying areas numbered 21,864: they were put up in 29 relief camps; 21,517 houses were damaged and 14,773 ha of paddy and horticultural crops were damaged. The total number of deaths were 100. The damages added up to Rs 12,910 lakhs. The state government had sanctioned Rs 716 lakhs to the districts of East and West Godavari, Nellore, Chittoor, Cuddapah, Kurnool, and Ananthapur for the taking up of urgent repairs and restoration works.

The cyclone had only brushed the coast at Nellore and then curved northeastwards and away from the coast. This self-deflection reduced the impact of the storm, borne out by the fact that the losses in Nellore district were comparatively less than those in the other four districts (*marked ***). The clear indication is that the eastern parts of Chittoor, Cuddapah, Ananthapur and Kurnool are more vulnerable to cyclones, and they will, in all probability, be the most distressed in future cyclones.

DETAILS OF NOTABLE DAMAGES IN DISTRICTS

District	People Evacuated	Human Deaths	Live-stock Loss	Houses Fully Damaged	Houses Partial Damaged	Total Houses	Crop Damaged Paddy (Ha)	Crop Damaged Others (Ha)
Viskhapatnam	-	1	-	22	40	62	-	621
East Godavari	1100	16	14	940	1691	2631	6107	3596
West Godavari	7484	2	11	400	1056	1456	697	323
Nellore	720	5	76	58	71	129	90	1220
Chittoor **	4800	37	76	1666	2907	4573	-	997
Cuddapah **	1580	6	1368	717	3064	3781	-	946
Kurnool **	6000	11	27	2039	5144	7183	-	51
Ananthapur **	-	3	-	482	1143	1625	46	79
Total	21684	81	1572	6324	15116	21440	46	7833
Total State	21684	100	1607	6354	15163	21517	6940	7833
Total ** Dists.	12380	57	1471	4904	12258	17162	46	2073
Percentage to the Total-State	57.09	57	91.53	77.18	80.84	79.76	0.66	26.46

Two months later, the state again faced a series of disasters in the form of three successive periods of heavy rains leading to floods in the months of August, September, and twice in October. The details, including the losses during the June cyclone, are given below:

Human deaths	100
Livestock loss	1,607
Houses damaged	21,517
Crop area damaged	14,773 ha
Estimated loss	129.10 (Rs in crores)

NOVEMBER 1996

The system formed as a depression at 1500 hrs GMT on November 4 and was about 600 km east of Machilipatnam. It travelled in a westerly direction and became a deep depression at 0530 hrs. Continuing in the same direction, it intensified into a cyclone by 1730 hrs and became a severe cyclonic storm at 2330 hrs. It kept intensifying along the same path and became a severe cyclonic storm with a core of hurricane winds at 0830 hrs on

November 6. Following this, it changed its course slightly to the north and crossed the coast south of Kakinada in East Godavari district at about 1900 hrs the same day.

This was a small system about 60-70 km in diameter. The usual change in the weather well before the storm approaches the coast was absent: the weather was almost clear, and there was no indication that matters would suddenly turn worse. The fishermen of East Godavari district had ventured out to sea with no apprehensions: 1,683 of them are missing to this day. It later became apparent that the warnings given by the CWC were ignored by the fishermen, and this tendency to ignore official messages continues to bedevil cyclone victim reduction.

The cyclone caused extensive damage to properties and claimed 1,077 human lives; 616,553 houses were damaged, 510,616 ha of cropped areas in East and West Godavari and Krishna districts were virtually razed. The total losses were estimated at a whopping Rs 612,925 lakhs. The state government released Rs 2,050 lakhs for immediate relief and restoration measures, and had requested the Central government for assistance of Rs 214,283 lakhs.

The losses suffered by the districts are given in the following table:

DISTRICT - WISE LOSSES IN CYCLONE OF NOVEMBER 1996 AND RELIEF PROVIDED TO THE VICTIMS

LOSSES AND DAMAGES

Ser No	Damages/Relief amount in Lakhs	East Godavari	West Godavari	Krishna	Khammam	Total
1	a) No of villages	141159	90146	93	-	2405
	b) No of Mandals			9	-	114
2	Population Affected	4542369	3500000	19873	-	8062242
3	Population evacuated	149156	28000	14193	-	191349
4	a) Human lives lost	978	98	-	1	1077
	b) Persons missing	1683	-	-	-	1683
5	a) Cattle losses	11848	2838	21	-	14707
	b) Other animal losses	5455	1781	15	-	7251
	c) Total Value (Rs In Lakhs)	2197.52	2303.48	-	-	4500
6	a) Houses damaged Fully	257002	50581	346	148	308077
	b) Houses damaged partly	183729	124067	574	106	308476
7	Crop area affected in Hects	25335	237785	19496	-	510616

RELIEF OPERATIONS

Ser No	Damages/Relief amount in Lakhs	East Godavari	West Godavari	Krishna	Khammam	Total
1	Exgratia to NOK of deceased					
	a) Number	653	79	-	-	732
	b) Amount (Rs In lakhs)	549.90	79.00	-	-	628.90
2	Distribution of Rice					
	a) Number of families	735140	308160	681	-	1043981
	b) Qty. of rice (Qtls.)	175284	77040	170.25	-	252494.25
	c) Value (Rs in lakhs)	1191.931	523.872	1.16	-	1716.56
3	House Damages					
	a) Fully – Amount in lakhs	2570.02	485.48	3.46	-	3058.96
	b) Partial	918.645	599.375	2.87	-	1520.89
4	Disbursement of Relief-kind					
	a) Clothes (Rs In lakhs)	260.546	47.263	0.346	-	308.155
	b) Utencils		47.263	0.346	-	308.155
5	Other disbursement of relief-Value (Rs In lakhs)					
	a) Ex-gratia to injured persons	33.08	1.18	-	-	34.26
	b) Compensation –Weavers	49.163	5.531	-	-	54.694
	c) Compensation-Fishermen	124.98	8.83	-	-	133.81
	d) Relief to Agri. sect.	-	712.00	-	-	712.00
	e) Kersene disbursed	71.40	72.93	-	-	144.33
	f) Ex-gratia to missing pers	75.70	-	-	-	75.70
TOTAL AMOUNT IN LAKHS						8694.814

(Source : Notes on Cyclone in Nov. 1996 Cyclone. Revenue Department Government of AP)

Besides the above expenditure on relief and rehabilitation, the state government had released funds to the sectoral departments for restoration works.

Department	Amount released (Rs in lakhs)
Public Health	15.00
Panchayati Raj	139.00
Municipal Administration	25.00
Irrigation	32.43
Medical and Health	93.00
APSEB	1,750.00
Agriculture	547.00
Animal Husbandr	40.00
APSRTC	1.02
District Collectors	7,900.00
APSIDC	40.00
TOTAL	10,582.45

(Source: Note on Damages/Relief Operations during 1996-97 of Revenue (Relief) Department, February 15, 1997)

Development of the 6th November Cyclone

The system became a depression at 0000 hrs GMT on November 5 and six hours later intensified to a deep depression. Nine hours later, at 0900 hrs GMT, it developed into a cyclonic storm. Intensification continued and it became a severe cyclonic storm at 0300 hours GMT on November 6. From its inception, it moved on an east-west axis along latitude 16 degrees north. At this point, 0830 hrs IST on November 6, it lay 200 km from the coast at latitude 16 degrees north and longitude 84 degrees east. Thereafter, it changed its course slightly northwards and intensified into a severe cyclonic storm with a core of hurricane winds by 0900 hrs GMT on November 6. At 1430 hrs IST, its position was at latitude 16.4 degrees north and longitude 83.0 degrees east, located 120 km southeast of Kakinada.

The message from the CWC somehow failed to reach the Collectorate through the police wireless net. The records in the files show that it was sent as a telegram handed in at **1910 hrs** on November 6, and was received at the Kakinada telegraph office at 1945 hrs but could not be delivered over the telephone as they "were out of order" (according to the noting on the telegram in the file). The cyclone was actually beginning to cross Kakinada around that time.

Although it originated at the CWC at Visakhapatnam at **1830 hrs** on November 6, the message about the cyclone being located 100 km from Kakinada did not reach the East Godavari Collectorate in time. The file record shows that the message was handed in at **1921 hrs** and the time of delivery is shown as 2201 hrs. But when it was actually received at the Collectorate is not recorded on the message.

In any case, the time of receipt would not have made any difference because, in all probability, the cyclone was already halfway across the district. With all the sophisticated communication systems available, the non-delivery of the latest position before its crossing was a systems failure of major proportions. It is a different matter that the Collector was informed over the telephone around 1700 hrs that the cyclone was heading towards East Godavari.

The cyclone crossed the coast in the Amalapuram area early on the night of November 6. Had it continued along latitude 16

degrees north till it hit land, the brunt of the damage would have been borne by the Avanigadda area of Krishna district, and the impact would ripple out through Krishna, Guntur and perhaps the Chirala region of Prakasam district.

The cyclone entered the radar picture at about 1200 hrs on November 5 and was last reported located 50 km southwest of Kakinada at 2330 hrs on November 6. That means it travelled 460 km between 1200 hrs on November 5 and 2330 hrs on November 6, a duration of 35 hours 30 minutes. Between 1430 hrs and 1730 hrs on November 5, it remained stationary 350 km off the coast. This time span ostensibly gives it an average speed of 12.7 kmph. But this is a deceptive perception. In fact, it moved from its position at 16.4 degrees north and 82.7 degrees east, about 100 km southeast of Kakinada at 1730 hrs on November 6 to 50 km southwest of Kakinada at 2330 hrs on November 6. A distance of 150 km in six hours gives it a speed of 35 kmph.

The scrutiny of the above cyclone tract seems to give us substantial reason to believe that cyclones pick up speed when they are about 100-150 km from the coast.

DECEMBER 1996

November witnessed a short-duration, intense cyclone that affected only three districts – East Godavari, West Godavari and Krishna – but the losses far exceeded those in the 1990 cyclone which affected 10 districts. That it didn't cross the coast was a small mercy: the path of the cyclone nevertheless ensured 27 deaths, 293 livestock losses, 7,569 houses and 21,091 ha of crops damaged, and 134 ha sandcast. The total loss amounted to Rs 5,359 lakhs.

Recap

From 1977 to date, the state of Andhra Pradesh has been struck by 18 cyclones, with 1985 and 1987 suffering three cyclones each.

Comments

Major portion of loss estimates are generally taken up by infrastructural damages. The lacunae lie in poor maintenance and construction standards. Restoration, in fact, uses up 50 per cent of the total post-cyclone expenditure. It is a case of resources badly spent for resources badly used.

RELIEF, REHABILITATION, RESTORATION AND TOTAL LOSS ESTIMATES

(Rs in lakhs)

Year	Relief	Rehabilitation	Restoration	Total losses
1977	1,739.00	2,622.00	4,437.00	17,200.00
1979	1,261.69	1,471.50	1,076.00	18,000.00
1984	669.00	2,307.00	6,512.00	9,489.93
1985	17.203	40.80	1,458.00	2,426.12
1987	79.15	1,011.62	11,558.00	12,648.77
1989	689.43	1,299.48	2,093.46	4,082.37
1990	903.44	0.00	0.00	224,776.00
1994	1,285.00	0.00	21,471.46	62,593.18
1996	8,116.00	2,086.00	7,085.10	226,857.00
TOTAL	14,759.913	10,838.4	55,691.02	578,073.37

(Source: Memorandums on Cyclone Damages from 1984 to 1996, Revenue (Relief) Department, Government of AP)

DETAILS OF ESTIMATED LOSSES AND DAMAGES (1977-1996)

Year of cyclone	Districts affected	Human Deaths	Live-stock losses	Houses Damaged	Crop damaged (in lakh ha)	Est loss (Rs in lakhs)	Revenue Exp. (in lakhs)
Nov. 1977	8	9921	431786	1014800	33.36	17200.00	5305.80
May 1979	10	638	25082	609400	0.73	18000.00	7814.72
Nov. 1984	4	575	90650	320000	2.07	9489.93	4928.89
Nov. 1985	7	16	0	3196	1.06	2426.12	1850.54
Nov. 1987	12	119	0	110553	9.61	12648.77	4141.65
Nov. 1989	5	69	7117	149112	0.62	4082.37	10015.59
May 1990	14	976	5170301	1439659	4.80	224776.00	13357.78
Nov. 1994	7	172	512	79220	3.97	62593.18	2968.70
Nov. 1996	3	1077	19856	609628	5.11	226857.00	30822.00
TOTAL		13563	5745304	4335568	87.15	578073.37	81205.67

(Source: State Government Memorandums on Cyclones, Revenue (Relief) Department, AP Secretariat, The Andhra Cyclone of 1977 by Stephen P Cohen and C V Raghavulu, 1979, Vikas Publishing House)

The amount spent on restoration works is 68.5 per cent of the total of Rs 81,289 lakhs spent on relief, rehabilitation and restoration, which itself comes to just about 14.06 per cent of the total losses estimated at Rs 578,073 lakhs. Even if the loss estimates are inflated by 100 per cent (no larger margin can rationally be asked for), the difference is still 20.12 per cent of Rs 289,036 lakhs. One is left wondering whether this vast gap can ever be narrowed.

The table '*Details of Estimated Loses and Damages (1977-1996)*' on page 62 presents a few essential losses as an indication of the enormity of the problem.

Observations

- The table reveals that the impact of cyclones depend on their characteristics. Certainly, the scope of damages extends well beyond the confines of the coastal districts.
- Human deaths have reduced through 1979 to 1989 and in 1994. The reason perhaps lies in increased public and governmental awareness and the implementation of the Cyclone Contingency Plan of 1981 by the state government.
- The loss estimates also show a corresponding decrease but the resources used do not exhibit a similar relationship.
- The highest losses were recorded in 1990, which was a large one and affected the entire coast. In comparison, the smaller cyclone of November 1996 affected only two districts, but the estimated cost of the damages it caused was almost equal to that of 1990 cyclone.

Comments

Over the years, the result of work done by the developed countries on natural hazards, and the consequent advances made in the field of disaster prediction has been a considerable change in the general attitude towards natural disasters. Even in a developing country like India, where resources are perforce distributed across a wide spectrum of developmental imperatives, cyclone warning systems, for instance, have been substantially upgraded. The logistics of relief and rehabilitation have also improved with the timely mobilisation of the armed forces and

the paramilitary, or government and non-government agencies, and of people's support in general.

To prevent this from painting an overwhelmingly optimistic picture, it must be iterated that in disaster situations where even "everything is never enough", so much needs to be done with so steady a focus that taking the eyes off people's priorities for a blink can mean incalculable damage in terms of disaster management projection and planning. Changes in planning have to be made from the conceptual stage onwards. As an example of what needs to be set right, the relocation of tens of thousands of people from cyclone-prone areas is a thoroughly impractical solution: but, despite its vast and urgent socioeconomic wastefulness, it is an act that is first out of the government's ready box of solutions. Risk evaluation will be both simple and cost-effective in the long-term, and is a manner of proactive resolving of problems that must be optimised as soon as possible. Every year that passes, due to delays costs thousands of lives.

There is a somewhat defeatist opinion expressed in many administrative and planning quarters that natural hazards are inexorably on the increase – and, unavoidably, so are the losses. The true reason for the escalation of losses due to cyclones lies in the expanding footprint of poverty among the marginalised sections of society in the coastal areas, furthermore, it is evident that often enough infrastructural development has little to do with individual progress. Because neither supports the other, the houses of people are not strong enough to resist the extreme push and pull of high winds and storm surges, on the one hand, and public utilities and infrastructure fail in the face of heavy rainfall, on the other. Drainage systems collapse, aiding waterlogging. When the waters recede, boats are rendered redundant and the roads are in too drastic a state of disrepair to support the logistics of relief and rehabilitation. While what should be working is an ideal double-backup, response-rescue situation of "either-or", the people are left floundering in the paralysis of "neither-nor".

The state government did adopt housing as one of the major mitigating measures after the 1977 cyclone, and followed this policy till end-1993. A number of houses were constructed in the cyclone-prone areas but their quality and durability remains in doubt. There is no stronger case than that for improving the

housing stock in the vulnerable areas: the focus of architectural research has to shift from the speed of building houses (and the consequent dubious durability that is attendant upon a tearing “developmental” hurry) to the proper – even traditional – techniques of making houses safe from cyclones. (There are a few, but very few, institutions where research has been conducted on damage to engineered structures, and on architectural damage control).

Disaster mitigation and management has to be woven into the fabric of development, even at the departmental level. It has to be incorporated into the constitution and functioning of all departments that oversee developmental projects, along with proactively higher design and construction standards prior to project approval.



6

Policy Issues :

GOVERNMENT RESPONSE TO CYCLONES -1 GOING BY THE BOOK

Cyclone Response: A Review

The government's contingencies in case of a cyclone are exhaustive – on paper; but the vast gap between committees and ground realities remains only too real

First set of recommendations

After the two cyclones of 1969, the Government of India formed a committee under the chairpersonship of Dr P Koteswaram, the erstwhile Director General of Observatories, Indian Meteorological Department (IMD). The committee's brief was to devise measures to avoid loss of life and damage to property by cyclones. More specifically, the committee's tasks included:

- 1) A review of evacuation measures
- 2) Bringing out pamphlets on precautionary measures
- 3) Recommending measures for timely warnings
- 4) Pinpointing areas likely to be affected
- 5) Providing area-specific information to warn fisherfolk

The committee submitted its report in 1971, with 49 recommendations dealing with a wide range of concerns. Still, the committee's recommendations were not fully implemented till the disastrous cyclone of November 1977.

Recommendations of Koteswaram Committee

The recommendations of the Koteswaram committee fall under the following major categories:

Recommendations 1-23: Introduction of better equipment for cyclone observation and dissemination of warnings. It included broadcasts over the All India Radio (AIR) and an alternate system, the provision of transistor radios to government officials, the fishery department, ports, village sarpanches/heads of hamlets, and owners of fishing boats.

Recommendations 24-29: Building of cyclone shelters in main villages along the coast, planting of windbreaks – Casuarina – up to 20 miles inland, extensive afforestation along the coast, encouraging farmers to build raised platforms to save the harvested crops, and provision of driers for stored crops.

Recommendations 30-37: Improvement of the storm-warning centres at Visakhapatnam, Madras and a flood forecasting station at Hyderabad, and better communications between them; and upgrading AIR stations. The committee advised the coordination of the transmission of warning by the state and inter-state police forces; the provision of telephones at the taluka headquarters, the provision of Very High Frequency (VHF) links in the P & T department, the setting up of control rooms at the district level, with officers nominated for special duties to disseminate warnings from the Cyclone Relief Committee at the state level.

Recommendations 38-40: Arrangements for evacuation. The report stressed on building or improving roads in major villages in the cyclone-prone areas. The report also stressed the need to educate people to pay heed to warnings.

Recommendations 41-46: Aspects of restoring communications/power supply; introduction of amphibious vehicles, power launches and helicopters for speedy assessment and rescue; modalities for declaring affected areas; the introduction of a state standing committee; the involving of the Air Force, Navy, fishery and port authorities in rescue/relief operations, especially of fishermen at sea; the provision of easily distinguished dress for fishermen for identification at sea.

Recommendations 47-49: Production and distribution of publicity material; adoption of a model cyclone plan for Coastal Andhra Pradesh, which would be reviewed annually; Central aid for the implementation of various emergency and long-term measures as recommended by the CDMC.

Some of these measures have been implemented already and some are yet to be implemented. As a result of this committee's recommendations, the state government should have prepared its Contingency Plan some time in the year 1972. Unfortunately, this did not happen till three years after the severe cyclone of November 1977.

Contingency Plan for Cyclones

The first contingency plan was formulated in 1981

The first Contingency Plan was formulated in 1981 and was updated in 1987. Although it is in use till today, the government is reviewing the plan.

The Plan identifies the Revenue Department as the nodal department to carry out all tasks related to the management of cyclones. A high-powered committee has been formed at the state level, headed by the Chief Secretary, with 53 senior officers in departments that have a role in cyclone management. There are two sub-committees – one headed by the Chief Secretary and the other by the Principal Secretary (Revenue) or the Relief Commissioner – to deal with the day-to-day exigencies in disaster management and to control the relief operations.

At the district level, District Collectors head a committee comprising of officers from the departments dealing with cyclone response. The committees meet twice a year – in April and September – to discuss the measures needed to keep the government machinery in readiness.

The contingency plan incorporates details of the Early Warning System with actions to be taken. The actions to be taken fall into two parts:

- a) On receipt of the “alert” for a cyclone
- b) On receipt of the cyclone “warning”

Control rooms are opened at the State Secretariat, the District Headquarters and the Mandal Headquarters, backed by a communications network and staff to maintain a 24-hour vigil. The actions on receipt of the “alert” are basically preparatory and the actions after the cyclone warning are those for “Evacuation, Rescue, Relief and Rehabilitation”. There is a separate chapter included on “Community Preparedness” through mass publicity, which includes advice to the people on precautions to be taken before and at the time of occurrence of the cyclone.

The Contingency Plan is put into effect on receipt of the first “alert” message from the Cyclone Warning Centre (CWC). The focus is on saving human lives, giving the appropriate relief, and

on restoring infrastructure as soon as possible. Thus, the main orientation of the plan is "Relief, Rehabilitation and Limited Restoration" within the available financial resources.

Comments on the Contingency Plan

The emphasis on relief also has some negative effects in the long-term. Over the years, the population has developed a "relief" syndrome in which people have abrogated their own efforts in cyclone management to those of the actions by the state government. As the state experiences more and more disasters more frequently, with increasing damages, it becomes overburdened.

The population has developed a 'relief' syndrome in which people have abrogated their own efforts in cyclone management to the government

The existing Contingency Plan is not comprehensive enough to include disaster preparedness measures such as the improvement of the infrastructure to reduce the impact of cyclones. It is stipulated that the Calamity Relief Fund (CRF) cannot be used for the creation of assets. This handicaps the efforts to build a protective infrastructure. In fact, one of the biggest reasons for the increasing infrastructure damage during cyclones could be their inferior construction. The absence of effective regulating measures in land use, building construction, and the unrestricted destruction of vegetative cover, have compounded the vulnerability of the structures.

It is important to allocate money for protective works, at least in the most vulnerable areas. A share of the total revenue receipts can be earmarked for this purpose. For selective work, what are required is vulnerability analyses, hazard mapping, and an integrated planning to dovetail developmental activities with disaster mitigation. This is particularly important as many departments are involved in the maintenance of the public assets for the use of the people.

Actors in the field

The Central government releases large amounts of funds based on the assessment reports of Central study teams. The state government has the direct responsibility for disaster relief, using the resources at its disposal. As the state government has limited

resources at its command, measures often tend to produce short-term results.

The governments of other countries provide aid, both financial and material, through international agencies and United Nations organisations. Many international donor and relief agencies operate in the state as independent bodies, linked only financially to their parent agency. The financial control is usually retained by the head offices of the agencies' countries of origin, enabling the agencies to act independently of political ties. Some voluntary groups and NGOs form disaster relief committees and disband them when the crisis is over.



Policy Issues :

GOVERNMENT RESPONSE TO CYCLONES -2 PROGRAMMES IN THE PIPELINE

A.P. Government's Policy on Disaster Management

Andhra Pradesh is now taking a fresh look at designing a long-term disaster management policy, with help from the World Bank

M Sahoo, IAS

Project initiative

After the debilitating cyclone in 1996, the state government of Andhra Pradesh was compelled to design a long-term disaster mitigation policy. It is today implementing the Andhra Pradesh Hazard Mitigation and Emergency Cyclone Recovery Project, with financial assistance from the World Bank, with the following objectives:

- To restore and strengthen the infrastructure with improved design and quality control measures, enhancing the early warning capacity of the IMD
- To conduct Hazard Mitigation Studies for accurate prediction of high-velocity winds, storm surges, cyclone tracking, flood forecasting and spatial flood warning through the communication network
- To prepare hazard maps to facilitate hazard mitigation works, raising awareness in communities

The IMD has plans to upgrade six radar facilities on the east coast (Calcutta, Paradeep, Visakhapatnam, Machilipatnam, Chennai and Karaikal). Under this project, some of the equipment requirements – including three Doppler radar systems, 10 high-capacity windspeed recorders, and the installation of 100

cyclone warning dissemination centres – will be financed by the Government of India. Doppler radar scans an area within a radius of 384 km. It can not only detect precipitation but also determine windspeed by measuring the movement of raindrops, insects, dust and aerosols. Warnings are issued sooner, saving lives and property, and they can calculate the intensity of rain and issue flood warnings.

Long-term mitigation policy

The government plans to have a long-term mitigation policy aided by key hazard mitigation studies to develop planning and development control measures. Studies in Coastal Management, Watershed and Delta Management, and Early Warning and Community Awareness are intended to be incorporated into the policy.

Efforts are being made to improve the design criteria, quality control and building code for high-risk areas. The development of an Early Warning System, awareness-raising of communities for disaster preparedness, the creation of community ownership of assets, and community involvement in maintaining and protecting the infrastructure are essentials under this project.

The Disaster Mitigation Council (DMC), constituted under the chairpersonship of chief ministers at the state level, is the apex body that oversees the implementation of the new policy. The Disaster Management Unit working under the Department of Finance and Planning will be the secretariat for the DMC. At the district level, a District Disaster Mitigation Committee under the chairpersonship of the District Collector, at the Mandal level, a Mandal Disaster Mitigation Committee, and at the village level, a Village Disaster Mitigation Committee, will be formed to coordinate all the activities of the hazard mitigation programmes.

Key hazard studies

In the key hazard studies for Coastal Management, Watershed and Delta Management and Hazard Mitigation Information System (HMIS), the attempt is to integrate information after the installation of various sensors (for rainfall, wind, river gauge, tidal gauge, etc). The Andhra Pradesh government has various initiatives in the information technology sector – National Infomatics Centre's inter-district computer network, video conferencing, the AP Statewide Area Network, data warehousing

Efforts are being made to improve the design criteria, quality control and building code for high-risk areas, but these are only the material aspects of disaster management

and the multipurpose household survey. They will provide scientific models on cyclones, storm surges, wind and rainfall forecasting. Another study will provide a GIS database for the entire state area and a district-wise action plan for watershed management.

The Mandal-level computerisation network will be linked to 1,123 Mandals, 78 revenue divisions and 23 districts and to the state headquarters to assess events promptly and initiate action. In the HMIS, the attempt is toward a simple query-based decision support system, and the key hazard studies will provide an expert-decision support system.

Furthermore, the National Institute of Ocean Technology has installed ocean buoys beyond the Chennai coast. Attempts are being made to obtain the data and link them for modelling purposes. The Department of Space has been launching satellites like the IRS IC, and will be launching OCEANSAT-I and II.

Ecological measures

Shelterbelt plantations have been taken up along the coast. Mangrove plantations have been developed, and seedlings have been distributed to the farmers in private lands. Works in drought-prone areas to improve the water table have been initiated in the watersheds by the construction of check dams, percolation tanks and afforestation, involving Watershed Management Committees.

Vulnerability reduction

The government has created the Vulnerability Reduction Fund under the provisions of Indian Trust Act, 1982 (Central Act 2 of 1988). The Vulnerability Reduction Fund Trust, constituted in September 1998, will act independently to assist vulnerable communities in strengthening structures and undertaking the maintenance of local infrastructures through drain clearance, road and culvert repairs, etc, with the participation of people to the extent of 50 per cent. Priority will be given to works in high-risk zones and areas prone to floods, cyclones and drought. The maximum grant from the fund will be Rs 10 lakh at the state level and Rs 5 lakh at the district level.

Excerpts from : Andhra Pradesh Government Policy on Disaster Management by M. Sahoo, India Disasters Report- Towards a policy initiative , Oxford University Press, 2000

World Bank and Cyclone Mitigation in Andhra Pradesh

CRITICAL PROGRAMMES

The World Bank's intervention in Andhra Pradesh is crucial, as much to dispel long-held doubts about its structural adjustment programmes as to see whether it is up to the task of tackling government's inertia.

The World Bank has often attracted criticism from NGOs for its structural adjustment programmes worldwide in the beginning of the '90s, programmes that were perceived as anti-people. This is the reason why NGOs are now watching the World Bank's involvement in cyclone mitigation work in Andhra Pradesh.

After the May 1990 cyclone, the WB intervened in the AP Cyclone Emergency Reconstruction Project (CERP), offering a loan of US\$ 265 million of the estimated US\$ 380 million required for the entire project. In addition, the WB assistance was also intended to develop a "delta plan" to modernise water management in the Krishna-Godavari delta.

As planned, the CERP project closed in March 1993, and left the raising of several questions for the future. The Implementation Completion Report (ICR) lauded the reconstruction component. The fact that the cyclone shelters that were built were in good condition and were used extensively during the emergency period in the 1996 cyclone was mentioned to prove this. (It may be noted here that, in distinct contrast, the emergency shelters built in the aftermath of the 1977 cyclone were in a state of disrepair.).

But the ICR also raised concern about the impossibility of the long-term sustainability of the CERP's mitigation objectives. The Report noted that "the continuing inadequacy of maintenance funding for existing works threatens their sustainability, and the failure to identify coordinated follow-up programmes for development, protection and mitigation in the project area means that a high risk of future disasters continue to exist."¹

The Bank's documents blamed two popular programmes of the erstwhile government, namely subsidised rice and prohibition of liquor sales, for the state's dwindling financial resources. The document said: "...The overall impact of the latest (read 1996) cyclone on the state's economy was significant, especially considering that its finances were already precarious following the loss of revenue due to the 1994 introduction of subsidised rice prices, and the prohibition of liquor sales."²

Subsequently the two welfare measures derided above, which helped the Telugu Desam party return to power in the elections, were withdrawn by the government. Logically enough, NGOs blamed the withdrawal of the measures on the World Bank.

¹ The World Bank, April 11, 1997, *Technical Annex on a Proposed Loan and Credit to India for an Andhra Pradesh Hazard Mitigation and Emergency Cyclone Recovery Project*, The Energy and Infrastructure Operations Division, Country Department II, South Asia Region.

² The World Bank, April 11, 1997

'VOLUNTARY INITIATIVE CAN BE IMPROVED'

Interview with Relief Commissioner, Mr. Bhaskar Prasad, IAS

How is disaster relief linked to development issues?

All vulnerable places should be brought into the regular budget of each department. Development measures should include disaster mitigation aspects. The financial aspect of the Contingency Plan should be built into the departmental budget. At the same time, the Calamity Relief Fund (CRF) should be used carefully for immediate succour after a calamity.

Independent relief agencies argue that it is not advisable to treat relief and rehabilitation as watertight compartments. Do you agree?

Rehabilitation should be handled by normal departments, the ones that deal with drought or whatever calamity. They should build houses, educate people, and create awareness. You have to make a broad distinction between relief and rehabilitation. They cannot go together. We should not mix them. If we did, the relief commissioner would be shifting his attention from disaster to disaster. It is doubtful that he or she would have time for long-term involvement in a disaster site – which is what rehabilitation is all about. Normal departments as well as local institutions should take up long-term tasks. For example, the local agriculture college can train farmers to keep their crops flood-resistant. In drought-prone areas, the long-term action involves storage of grain, credit support, etc. There is also the possibility of diverting into sheep rearing and so on.

What improvement do you see in the district-level response to cyclone?

Districts are responding to cyclones in a more proactive way. District-level committees are headed by the Collector. The committee meets twice a year. This time, we suggested that the committees meet to plan for flood contingency before the monsoon. Now, each district has come out with a set of innovations. The committee of East Godavari district has recommended the use of lifeboats and life jackets. Others have suggested wireless sets for fishermen at sea. There is emphasis on mobilising people. One Collector has told the mandal officials, "Don't wait for my order. Watch the TV and go ahead." There is wide appreciation for informal institutionalisation. On our part, we have had the District Collector of Visakhapatnam come out with a proper, comprehensive contingency plan that will become a model for others.

What is the importance of voluntary initiatives?

Voluntary initiative can be improved. Real leadership can often be found outside the official system. A doctor has organised government and private doctors. My brother has fed 30 families who had taken shelter in the veranda of our house for 15 days. Much more can be done. Large rice mills can give space to people and run community kitchens. Private doctors can organise themselves, without waiting for a call from the Collector. Community response is particularly important during the first 10-15 days following a cyclone. Of course, there are many aspects where only the government action can be the solution. I would strongly recommend community organisation, which can be a link between the villagers and helping agencies, including the government. Community-based organisations are better equipped than the government in generating awareness and organising people.



Policy Issues :

GOVERNMENT RESPONSE TO CYCLONES -3

GRATUITOUS IN THE EXTREME

Relief in Practice

A review of response to cyclones in Andhra Pradesh shows that relief and rehabilitation still have a long way to go before they even approach adequacy.

1977 cyclone

Before the 1977 cyclone, Andhra Pradesh had suffered successive cyclones in October-November 1976, when nine districts were affected. The 1977 cyclone badly affected Krishna and Guntur: 14 villages in Bandar taluka, 17 villages in Divi taluka and 16 villages in Repalle taluka were submerged and 9,921 people died. The government swung into action fairly quickly, providing relief to the people by way of supply of food, water, clothing, etc.

The armed forces, the disaster stormtroopers of the country and earlier called in only when every other avenue had failed, are now the first line of action

The armed forces

The armed forces are the disaster stormtroopers of the country, earlier called in when every other avenue had failed, now called in virtually proactively: they have always assisted the civil government during natural calamities (apart from their preventive duties during civil conflicts) in many parts of the country. But during the 1977 cyclone, the Andhra Pradesh state government was roundly criticised for not having taken the army's help for evacuation.

Instead, using the convoluted logic of those seeking to desperately deflect criticism, the then chief minister, J Vengala

Rao, had said in his statement on the cyclone to the members of the State Assembly: "The destruction caused by the fury of Nature could not have been prevented even by the presence of the army.

"Although, no doubt, the army had informed us on the 18th night that they were standing by, in the absence of information about precise point of impact of the storm and the damage likely to be caused, and the nature of army assistance that would be consequently required, and the task that could be assigned to the army, we could not have requisitioned their services..."³

Financial aspect

Visibly gratuitous relief and a humiliating *ex-gratia* payment of Rs 1,000 for each dead (including children above 5 years old) were paid to all the villagers of all the districts affected by the cyclone. A total of Rs 17.39 crores was paid to Krishna, Guntur, Prakasam, West Godavari, East Godavari, Visakhapatnam, Srikakulam and Khammam districts. The damages were estimated to be about Rs 1,000 crores, which were projected to the Central government who, following the visit of the Central team, provided assistance of Rs 56.52 crores.

The remainder was utilised for other measures such as the rehabilitation of weavers, artisans, and fishermen, and the

A major portion of the assistance was allocated as follows:

Items of expenditure	Rs (in crores)
Restoration of roads and buildings	10
Restoration of electricity	10
Assistance to agriculturists	7.64
Resettlement of people rendered homeless	6
Restoration of irrigation works	6
Restoration of public buildings	5

³ Edited extract from paragraph 3 and 4 from *Statement on Cyclone & Tidal Wave on 19th November, 1977* by J Vengala Rao, Chief Minister of Andhra Pradesh

restoration of schools, drinking water wells, municipal property, public health, drainage, ports, etc.

In addition, the Centre gave Rs. 3.11 crores towards the rehabilitation of tobacco farmers, small and marginal farmers, and those dependent on cattle and poultry. The Centre also donated 45,000 tonnes each of rice and wheat.

The state government requested a further sum of Rs 16.77 crores to complete the rehabilitation programmes. In response, the Centre sanctioned Rs 11.46 crores, which was mainly used for works pertaining to irrigation, municipal development and the Panchayati Raj.

Rehabilitation

As a relief to the agricultural community, remission of land revenue was sanctioned to the tune of Rs 7.34 crores. It was estimated that 14,666 fishermen had been affected by the loss of their fishing vessels, tackles and nylon nets. Rs 161.23 lakhs were spent on these fishermen and six boat-building yards were set up. The items necessary supplied were at 75 per cent subsidy and on a 25 per cent loan basis in the tidal wave-affected areas, and at 50 per cent subsidy and on a 50 per cent loan basis in the other areas.

As many as 41,828 weavers had lost their looms and/or yarn. Rs 150 was paid as compensation for the loss of a loom and Rs. 100 by way supply of yarn in kind. The relief was in the nature of 75 per cent grant and 25 per cent loan for Bandar and Divi talukas of Krishna district and the villages affected by the Sarada river floods in Visakhapatnam district and at 50 per cent grant and 50 per cent loan in other districts. Rs 2.25 crores was thus utilised. 7,500 artisans of various categories were identified and Rs 68.5 lakhs was distributed to help them to help them replace the loss of tools and kits.

Restoration

Restoration work was carried out by the concerned departments as per these allocations:

Departmental works	Rs (in crores)
Panchayati Raj	11.71
Transport, roads and buildings	6.33
Irrigation and power	18.51
Industries	3.16
Education	1.38
Municipal	1.49
Public health	0.93
Agriculture	1.48

Almost Rs 16.30 crores were spent on the resettlement of people rendered homeless.

Cyclone response after 1977

Ex-gratia payment for the death of any member of the family aged over five years was fixed at Rs 1,000 for the 1977 cyclone victims. It was paid irrespective of the number of persons who had died or whether they were earning members or not. The same policy was followed faithfully for the 1979 cyclone by the next chief minister.

This amount was revised to Rs 5,000 in 1987 to render it at par with the norms suggested by the Government of India in July 1986. The amount at present is Rs 100,000. Similar liberalisation in the matter of such payment has also been hiked regarding all the other relief measures, inevitably causing an additional strain on the state budget.

The Calamity Relief Fund created by Government of India for this purpose is falling drastically short of the pressing requirements of restoration works, which demand a greater allocation of funds in order to revert the essential services to pre-cyclone standards.

REHABILITATION RESETTLEMENT AND RESTORATION

Taking stock of damages and losses: 1977-1996

Given below are the details of the damages and losses sustained in cyclones, narrated in the preceding section. The summary given in the following table is those of important statistics, affixed directly below with some comments about the government response.

Year	Districts Deaths	Livestock Loss	Houses damaged	Crop damaged (lakh ha)	Est. Loss (lakhs)	Rev. Exp. (Rs lakhs)
Nov 1977 8	9,921	431,786	1,014,800	33.36	17,200	5,305.80
May 1979 10	638	25,082	609,400	0.73	18,000	7,814.72
Nov 1984 4	575	90,650	320,000	2.07	9,489.93	4,928.89
Nov 1985 7	16	0	3,196	1.06	2426.12	1,850.54
Nov 1987 12	119	0	110,553	9.61	12,648.77	4,141.65
Nov 1989 5	69	7,117	149,112	0.62	4,082.37	10,015.59
May 1990 14	976	5,170,301	1,439,659	4.80	224,776.00	13,357.78
Nov 1994 7	172	512	79,220	3.97	62,593.18	2,968.70
Nov 1996 3	1,077	19,856	609,628	5.11	226,857.00	30,822.00
TOTAL	13,563	5,745,304	4,335,568	87.15	578,073.37	81,205.67

(Source: State government Memorandums on Cyclones – Relief Department, AP Technical Library, Secretariat)

Comments

The above table reveals that the range effects that cyclones have upon the various districts of the state depends on their characteristics. What is certain is that the scope of damage extends beyond just the confines of the coastal districts: the “spillover” of the cyclones affects the districts of Chittoor, Cuddapah, Kurnool, Nalgonda and Khammam.

There has been a perceptible reduction in human losses from 1984 to 1989, and then in 1994. This would be a statistical aberration were it not attributed to the formulation and implementation of the state Contingency Plan for Cyclones. In fact, in an intervening year, 1990, the losses due to property

damages and destruction shot high because of the increase in scale and intensity of the cyclone compared to the previous three.

The November 1996 cyclone was physically a much smaller cyclone and affected only two districts, mainly that of East Godavari, and, to a lesser extent, West Godavari. But the losses sustained were slightly more than in the 1990 cyclone.

The conclusion, therefore, is inescapable that the scale of damages is proportional not to the size of the cyclone but to the vulnerability of the various elements exposed to the hazard.

For the state, relief and rehabilitation is a no-win situation. The percentage of revenue expenditure to the total loss estimates works out to an average of 14.05 per cent approximately. Besides the Calamity Relief fund (CRF) given by the Government of India, the additional amount required by the state is assessed first by a Central team: only then does some money flow to the state.

To offset the dispassionate decrease in Central allocation rendered by distance from the ground realities in the state, the estimates are, by and large, made on the higher side. As a leverage for impressing the Central government to part with larger additional grants and/or loans, it does not work as well as it is supposed to, obviously because the Central government is expecting it. Assuming the actual losses are 50 per cent of the estimates projected, the amount totals to Rs 28,9036.5 lakhs; against this amount, the revenue expenditure is Rs 81,205 lakhs. The percentage due settled works out to only 28.09 per cent. In no way does the gaping chasm between the loss estimates and the resources made available even begin to be filled.

The result of such under-financing is that the physical infrastructure damaged cannot be restored to the original standards due to the enormity of the number of works requiring restoration. In this regard, it is worth mentioning the case history studied by the National Institute for rural Development (NIRD) study team of the road sections that were damaged in three cyclones and floods in 1988, 1990 and 1992. They found that the same sections of the roads were damaged every time. When the matter was discussed with the engineers, they revealed that under-financing had made it impossible to get roads repaired to match their original standard and specifications.

The problem with under-financing and an arbitrary multitude of restoration works is that physical infrastructure damage cannot be restored to pre-disaster levels

DEALING WITH LOSSES

Revenue expenditures for the cyclone years

The revenue expenditures for the cyclone years as per the releases made under *Main Head 2245 for Natural Calamities* is given in the table below:

RELEASES UNDER MAIN HEAD 2245 – NATURAL CALAMITIES

(All figures in Rs in lakhs)

Cyclone year	Drought	Cyclone/floods	Total non-plan
1985-86	730.08	1,850.54	2,580.73
1987-88	546.88	4,141.65	4,978.17
1989-90	265.59	10,015.59	10,349.44
1990-91	165.20	13,357.78	13,733.53
1994-95	4,120.45	2,968.70	7,089.16
1996-97	284.12	27,582.64	59,749.98
TOTAL	6,112.32	59,916.9	98,481.01

(Source: Budget in Brief, Technical Library, Secretariat Government of A.P.)

The above data has been culled from the total releases made under various heads, and only that pertaining to droughts and cyclones have been shown. We wish to emphasise the fact that while some parts of the state are affected by cyclones alone, there are other areas that are affected by drought conditions, and which warrant expenditure under the authorised fund. Data for the cyclones prior to 1985 is unfortunately not available, having been destroyed.

Housing programme

Due to the magnitude of the damages in this (1996) cyclone, contributions were received into the Chief Minister's Relief Fund to the tune of over Rs 9.47 crores and several organisations came forward to construct houses and cyclone shelters along the coast. The government formulated a scheme to give 50 per cent matching grant to the voluntary organisations coming forward to construct houses. The plan for reconstruction envisaged a total of 20,000 houses, involving an expenditure of Rs 325 lakhs from the

voluntary Agencies and an equal amount from the CM's Fund. Most of the projects were taken up immediately and progressed quickly.

Similar ideas was also considered for the government by the chief minister after the 1979 cyclone. He had instituted a permanent housing scheme, with each house to be about 100 sq ft and costing about Rs 2,500. The proposal was for 100,000 houses built over two years at a cost of Rs 25 crores. The government had decided to set up a housing corporation to cover housing in general for the weaker sections and housing specifically in the areas affected or prone to be affected by natural hazards. The AP State Housing Corporation has, since its inception, built 216,096 houses in the coastal areas, of which it completed 197,404 houses up to mid-June 1998.

The year-wise progress is given below:

HOUSES CONSTRUCTED BY THE AP HOUSING CORPORATION IN COASTAL AREAS (1983 -TILL DATE)

Year	Taken up	Completed
1983-84	19,096	19,058
1984-85	12,471	12,471
1986-87	29,578	29,571
1990-91	55,000	55,000
1991-92	34,998	34,998
1992-93	2,727	2,532
1996-97	62,226	43,774
TOTAL	216,096	197,404

(Source: AP State Housing Corporation, Hyderabad)

Weaker Section Housing: The state government had constructed 984,562 houses for the weaker sections in the state up to May 31, 1990, at a cost of Rs 64,128.11 lakhs. The housing provided under this programme suffered damages in seven districts of the state in the 1990 cyclone.

The extent of the damages is given in the table below:

DAMAGE TO HOUSES OF THE WEAKER SECTION

District	Houses constructed	Houses damaged	Partly	Fully
Krishna	38,204	1,611	0	1,611
Guntur	45,153	1,244	0	1,244
Godavari (W)	53,810	7,373	0	7,373
Godavari (E)	77,393	7,065	217	7,282
Visakhapatnam	66,108	5,200	1,200	6,400
Vizianagaram	36,224	2,400	4,800	7,200
Khammam	48,637	2,520	28	2,548
TOTAL	365,529	27,413	6,245	33,658

(Source: Cyclone Reconstruction Project submitted to the World Bank by the state government of Andhra Pradesh in 1990)

Relief measures

The state government had promulgated the relief measures for different categories of victims/damages/losses through Government Order No 987 of October 17, 1987, which was based on the revised norms given by the Government of India effective from July 1, 1986 onwards.

The measures include *ex-gratia* payment of Rs 5,000 for the family of a deceased person and Rs 2,500 for the loss of a limb or of both eyes. Each family is given 10 kg of rice, clothing, and of utensils worth Rs 200. Assistance at different rates is given to the following categories of persons/damages:

- Artisans
- Weavers
- Fishermen
- Small and marginal farmers
- Loss of animals
- Damage to houses

The norms for each category are revised from time to time, based on logistical exigencies and the severity of a disaster. What is noticeable is that the measures cater expressly to the immediate requirements of the victims, and also to almost all categories of

people who require support for the losses they have suffered. This kind of support, virtually proactive in comparison to the relief assistance earlier in vogue, had started during the 1977 cyclone relief cycle and is continuing to date.

The scales of relief for the November 1996 cyclone were:

- *Ex-gratia* of Rs 100,000 to the families of the deceased
- Rs 5,000 for missing persons, the balance amount of Rs 95,000 on confirmation of death
- Rs 10,000 for grave injuries and Rs 2,000 for minor injuries
- Gratuitous relief of Rs 1,000+200 and 25 kg of rice for fully damaged houses, Rs 500 and 25 kg of rice for partly damaged houses
- To weavers: Rs 500 for damaged looms and Rs 200 for damaged yarn, and 25 kg of rice
- To fishermen: Rs 1,000 for lost boat, Rs 500 for damaged boat, and Rs 200 for damaged net
- To small and marginal farmers: Rs 625 (in cheque) per hectare for fully damaged agricultural crops, Rs 2,500 per ha for sandcasted areas for the removal of sand
- Rs 1,000 for petty shops damaged in the cyclone
- Three litres kerosene to all affected families (with or without cards), where electricity has not been restored. (In East Godavari, five litres of kerosene, in addition to the three litres given already in areas where power had not been restored)
- Postponement of water tax collections in the affected areas
- Recovery of crop loans postponed in the affected areas. Fresh loans to be sanctioned for the next commencing of crop
- Insurance claims to be preferred in respect of the farmers who avail of bank loans
- Roofing materials like bamboos. The Forest Department to sell ballies at half price

(Source: Revenue (Relief) Department Government Order No 1815 dated November 15, 1996)

Besides relief to the people, the government takes up immediate restoration works to repair the essential infrastructure in order to return life to normal as quickly as possible. The Government of India had in 1990-91 instituted the Calamity Relief Fund (CRF) to assist the states to undertake relief and restoration work with minimum delay following a disaster. The state contribution for

this fund is 25 per cent, with the Government of India contributing 75 per cent of the ceiling fixed for the state. The annual accretion of the CRF for 1990-91 was Rs 86 crores. After the May 1990 cyclone, Rs 61,50 crores was given as "Advance Grant", to be deducted at the rate of 25 per cent – Rs 15.29 crores per year for the next four years.

The annual outlay for 1996-97 was Rs 124.19 crores. After the November 1996 cyclone, the Central government released Rs 163 crores for relief operations. Apart from these mandatory outlays, there were releases made from the Prime Minister's Fund, contributions from other states, funding/voluntary agencies, corporate houses, individuals, etc. The details are given below:

OTHER FUNDS

Prime Minister's National Relief Fund	Rs 15,21,00,000.00
Donations	Rs 69,68,78,301.54
Total	Rs 84,89,78,301.54
Disbursements	Rs 76,06,66,000.00
Balance	Rs 08,83,12,301.54
Percentage	
10.40 per cent	
Relief/Rehabilitation	
<i>Ex-gratia</i> grant for hail/thunderstorm	Rs 01,75,37,000.00
<i>Ex-gratia</i> grant for victims of cyclone	Rs 19,03,65,000.00
Total	Rs 20,79,02,000.00
Percentage	24.50 per cent
Restoration /Repairs /Reconstruction	
AP Housing Corporation	Rs 34,01,49,000.00 **
Construction PHC in East Godavari	Rs 05,00,000.00
Road Bridge over Vrudha Gowthami	Rs 50,00,000.00
Bridges in East Godavari	Rs 3,40,00,000.00
Matching grant for Prakasam for cyclone shelters	Rs 18,65,000.00
Borewells in 22 districts	Rs 1,12,50,000.00
Repairs to 55 cyclone shelters	Rs 87,00,000.00
Matching grant to East/West Godavari and Prakasam	Rs 14,00,00,000.00
Completion of PHC in East Godavari	Rs 5,00,000.00
Road Bridge on Vrudha Gowthami	Rs 01,08,00,000.00
Total	Rs 55,27,64,000.00
Percentage	65.11 per cent

(Source: Relief Department and Brief Note on Relief and Rehabilitation Measures to the Victims Affected by Cyclone in 1996 by the Revenue Minister)

Despite the fact that 65.11 per cent is spent on reconstruction works, this spontaneous response is not enough to build up the affected area to an extent where normal life can be resumed as approximately to normalcy as possible. Clearly, the Central government's rescue mission to the state government falls short in both cash and kind.

The costs of this orientation have prevented any concerted effort in long-term disaster mitigation. The ultra-cautious financial policy adopted by the Central government since 1990-91 does not give much hope to the state government to expect financial support beyond the clearly insufficient share already apportioned by the Central government. The losses being almost metronomically sustained in the course of the cyclones are exacerbated by many factors not immediately open to solution, and the available funds are just not enough to restore the essential infrastructure to pre-cyclone standards. This is further compounded by the fact that development usually progresses without taking into consideration the ongoing vulnerability of the areas. Thus, assets created in the process of development have a built-in susceptibility to cyclones.

We have here a depressing scenario of an eroding ecology confronted with economic development run amok to meet the growing aspirations of an exploding population. Naturally, cyclone damages are unprecedented and increasing, and necessitate funding that is beyond the scope of the current pattern of financing.

What we have is a disaster scenario of an eroding ecology confronted with economic development run amok to meet the aspirations of an exploding population

November-December 1996 cyclones

The November and December 1996 cyclones caused extensive damage and, The Central government helped the state government with Rs 163 crores from the CRF. The expenditure incurred for the cyclones in 1996-97 is given below:

Pattern of financing

The Central government studied the pattern of expenditure of the states for calamity relief over the past 10 years and fixed a ceiling for each state. The Central government created the CRF, for which the contributions were in the ratio of 25:75 by the state and the Central government every year. This fund is to be

operated by a committee under the Chairpersonship of the Chief Secretary of the state along with officials normally connected with relief work. The state government is expected to meet all expenditures arising out of natural calamities throughout the year from the CRF.

Any unspent balance at the end of the year can be carried over to the following year. In case in a particular year the amount required by a state were to exceed that available in the fund, it may draw 25 per cent of the amount due in the following year from the Centre, to be adjusted against the state's entitlement in the subsequent year.

Through the financial year 1990-91 to 1994-95, the government of Andhra Pradesh's withdrawal ceiling from the CRF was assessed at Rs 86 crores per year. The state government had to contribute Rs 21.50 crores and the Central government was liable for Rs 64.50 crores.

The losses suffered in the May 1990 cyclone led to an additional advance of Rs 61.15 crores in order to meet the costs of relief and rehabilitation. This amount was adjusted against the entitlement of the next four years in equal instalments of Rs 15.29 crores per year.

The resources were not adequate to carry out long-term mitigation measures, and this led the state to approach international funding agencies to support the reconstruction plans for the affected areas. The first such feeler was sent out following the May 1990 cyclone.

The state government prepared a comprehensive multi-sectoral, cost effective reconstruction programme, in which the sector-wise projects were designed as sub-projects. The report was submitted to the World Bank, which carried out its own assessment and agreed to provide resources and technical support, with the caveat that it was to ensure that the necessary reconstruction and rehabilitation of infrastructure and the restoration of productivity was to be accelerated and implemented in the most efficient manner.

The details are given in the following table:

RECONSTRUCTION PROGRAMME	
Sector	Outlay (Rs in lakhs)
Cyclone shelters	8,915
Shelterbelts	8,500
Housing and public buildings	42,015
Roads and communications	72,247
Electricity	25,203
Drainage	45,830
Rural water supply	11,336
Minor irrigation	54,500
Tribal Area Plan	2,902
Agriculture and allied activities	8,626
Total	280,074

(Source: Government of AP Cyclone Reconstruction Project-1990)

The proposals were considered and were approved for US\$ 380 million. The major components of the funding plan were irrigation and drainage, roads and bridges, electricity, and agriculture and fisheries, which together accounted for 81 per cent of the total. The remainder was for cyclone shelters, rural water supply, municipal services, public buildings, housing, and coastal shelterbelts.

The project, named the Andhra Pradesh Cyclone Emergency Reconstruction Project (CERP), was closed in March 1993 as planned. Infrastructure restoration was completed, and thankfully incorporated higher design and construction standards – developments that helped the infrastructure withstand the fury of the November 1996 cyclone with remarkable fortitude.

However, after the excellent achievements under the CERP, the follow-up was poor. The maintenance of the project works, particularly in the irrigation and drainage sectors, was dismal. Nor were any programmes further formulated to follow-up for protection and mitigation in the vulnerable areas. As a corollary, while the death toll seems to be dropping, damage to infrastructure has continued to rise.

The compulsions of quick (and often knee-jerk) development dictated by the political needs of the party in power have resulted in an ad hoc strategy that does not incorporate disaster mitigation measures into the development process. The over-abundant but often insufficiently funded departments involved in development have each set their own targets, aiming at quantity and not the quality of infrastructure. The same departmentally narrow and non-coherent vision is in evidence in the reconstruction projects and works. Furthermore, the lack of adequate maintenance budgets, incorrect, inferior and obsolescent design and poor construction standards continue to diminish the achievement level of the state. Many of the damages in the November 1996 cyclone were due to the poor state of infrastructural repairs and the lack of maintenance.

There is little evidence of hands-on realisation that weather capriciousness is a long-term phenomenon and must be linked to developmental imperatives

There is little visible and hands-on realisation of the fact that weather is a long-term phenomenon and that cyclones will continue to bedevil the state, and that there is an urgent need to set priorities that draw an equitable balance between development and disaster mitigation – and, where called for, dovetail them. Andhra Pradesh could take a cue from other states like Tamil Nadu that have a more comprehensive cyclone disaster management plan, which includes vulnerability analysis, risk mapping, zoning and building regulations, cyclone resistant core units for huts, and cyclone-resistant community shelters. Equally important is the active involvement of the communities living in the cyclone-prone areas in the hazard mitigation programmes. This is the only way that could result in a disaster management plan that is an outcome of area-specific needs, and that is not a mishmash of plans made by various departments.

Of unappreciated magnitude is the need to give greater freedom and acting capacity to local bodies at the village level to implement mitigation measures, both traditional and contemporary, and to sustain them in the manner they find most effective.

The state suffered from a series of floods and cyclones from June to December 1996. The losses it incurred totalled Rs 7,576.74 crores.

EXPENDITURE INCURRED IN CYCLONES 1996-97

Sector	Expenditure (Rs in lakhs)
Supply of medicines	117.77
Roads and Buildings Department	1,467.47
Supply of seeds, fertilisers and agricultural inputs	2,117.83
Irrigation and flood control works	2,159.21
Panchayat Raj works	2,667.61
Municipal works	3,091.34
Electrical works	2,182.04
APSIDC	40.00
Ex-gratia payments to bereaved families	3,248.16
Food and clothing	2,623.58
Assistance for repairs to damaged houses	5,212.88
Supply of seeds and fertilisers	118.02
Supply of fodder	5.18
Others	2,267.71
TOTAL	27,318.80

(Source: Brief Note by the Minister for Revenue, Relief and Rehabilitation)

NEW PROPOSAL TO WORLD BANK

The demand for reconstruction tasks was enormous and continuing, and the state government once again sent a proposal for assistance to the World Bank. The main goal of the proposal was to restore the essential public infrastructure damaged and lost in order to enable the developmental processes linked to the infrastructure to progress. A significant departure from the previous strategy was that the housing and agricultural sectors were not included, since support for these sectors was obtained from other sources. Apart from this significant consideration, the experience gained in the management of the CERP through the years 1990-93 also influenced the change in approach.

The proposal had four major components:

- A comprehensive hazard management programme
- Restoration of damaged or vulnerable public infrastructure
- Creation of a Vulnerability Reduction Fund
- Technical assistance

In fact, for once the priorities identified were arrived at after consultations at the district – and not solely at the “overview” –

level. The plan evolved incorporating, organically as it were, the regional requirements and the operational needs of the sectoral departments who would be executing the various projects. Since all the three regions of the state face, usually overlapping, the risk of floods, cyclones and drought, the proposed plan included almost the entire state.

The second objective of the plan was to initiate the process of hazard management and infrastructure vulnerability reduction. The shape of the objectives is:

- To prepare, implement and institutionalise a long-term natural hazard mitigation programme in the three regions of the state that are at risk of cyclones, storm surges, floods and droughts
- To restore damaged public infrastructure using improved design criteria, cyclone- and flood-conscious siting, and higher standards of construction and quality control to enable infrastructure to withstand future disasters

The proposal envisaged a three-tier structure with the apex body headed by the chief minister, and a "disaster mitigation wing" in key line departments sandwiched between district level committees

The proposal envisaged a three-tier structure, with the apex body, the Andhra Pradesh Disaster Mitigation Council, headed by the Chief Minister and comprising key ministers and prominent figures of the civil society. The execution of the policies and directions of the Council's decisions would be carried out by the Andhra Pradesh Disaster Management Unit (APDMU) in the department of Finance and Planning, under the Chief Secretary, Finance and Planning. The main functions visualised were the management of projects, inter-departmental coordination, and planning for the long-term hazard reduction plans for the state.

The existing Disaster Management Unit (DMU) would be used for the procurement and disbursement functions, similar to what was done for the CERP. The inclusion of "disaster mitigation wings" was also proposed in each of the key line departments.

The third level of the organisation was the District Disaster Management Committee (DDMC). At the district level, the Collector would chair a committee constituted of district-level functionaries. Closer to the grassroots, the Mandal and village level committees would help mobilise and institutionalise community involvement in hazard reduction plans. The involvement of the elected representatives would be actively solicited and promoted.

Vulnerability Reduction activities

This included hazard and risk maps, design criteria, construction and quality control standards, integrated coastal zone management, water shed management, drought mitigation, and delta and flood control structure management. The DMU, in collaboration with the line departments, specialised agencies and consultants, would formulate action plans for hazard mitigation, emergency response and recovery.

Fractured and destroyed public infrastructure both has a crippling effect on relief and rehabilitation efforts and severely reins in the recouping capability of the community. The marginalised sections of society depend mainly on the public infrastructure, and this aspect was given priority in the proposal.

The main elements of infrastructure identified were power, drainage, public buildings, roads and bridges, tree shelterbelts, irrigation, watershed management works, restoration of flood banks, and cyclone shelters. The sectoral allocations proposed were:

Sector	WB assistance (Rs in crores)
Hazard mitigation	90
Vulnerability Reduction Fund	18
Power transmission and distribution	115
Roads maintained by the R&B Department	165
Roads maintained by the PR Department	44
Irrigation drains	78
Flood banks	46
Buildings maintained by the R&B Department	10
Buildings maintained by the PR Department	12
Shelterbelts	10
Watershed management	24
Cyclone shelters	8
Technical assistance	30
Incremental operating costs	18
Early Warning Systems by the Government of India	54
Price contingencies	130
TOTAL	852

(Source: Cyclone Emergency Mitigation and Recovery Project, Government of AP)

Project finalised

The AP Hazard Mitigation and Emergency Cyclone Recovery Project started the process of being implemented with the assistance of the World Bank with effect from July 9, 1998 at an estimated cost of Rs 800.789 crores, of which the component of the state government of Andhra Pradesh is Rs 743.65 crores and that of the Government of India Rs 57.14 crores. The final figure was arrived at after the World Bank had made its own appraisal of the project, adding the "Physical and Price Contingencies".

The details are:

Activity	Total (Rs in crores)
Hazard Management Programme	119.94
(a) Studies and other activities	59.28
(b) Coastal mapping	40.01
(c) Vulnerability Fund	20.65
Infrastructure restoration	570.51
(a) Electric power facilities	122.81
(b) Irrigation and drains	139.76
(c) State roads and bridges	185.97
(d) Rural roads and bridges	49.59
(e) Public buildings (PR)	12.80
(f) Public buildings (R&B)	12.00
(g) Mitigation works	
● Cyclone shelters	9.02
● Coastal shelters	11.27
● Watershed management	27.29
Technical assistance	53.21
(a) Institutional strengthening	20.29
(b) Consultancies, training and equipment	32.92
TOTAL	734.66

(Source: Brief Note by the Minister for Revenue, Relief and Rehabilitation)

Benefits expected

The cardinal benefit of the project will be the realisation of the urgent and long-felt need for extensive and extended cyclone and flood hazard reduction measures that would reduce the loss of life, damage to property, and impact to productive capacity in future disasters by:

- Timely and adequate completion of the repair and/or reconstruction of basic infrastructure to higher design and construction standards to restore economic activity and reduce hardship to the affected population
- The prevention of salinity and storm surges, along with improving watershed management, leading to more stable agricultural production in the highly vulnerable districts
- The involvement of local communities to enhance sustainability of the restored infrastructure and hazard mitigation structures
- The enhancement of institutional capacity that is hoped to be in place by the end of the project period

We cannot stop disasters, but we can minimise their impact

We hope that the integrated approach to coastal and delta management will lead to better environmental practices than that is the traditional norm and that dictated by the exigencies of development and politics, thus decreasing the vulnerability of the coastal areas. Also no less imperative is the arresting of the exponential depletion of natural resources now taking place and the reduction of the vulnerability of the planned irrigation and transport infrastructure facilities.

There is, however, some apprehension that the Government of India may fall short of improving the Early Warning System for cyclones, as envisaged in the project – an incomplete rendering of priorities that could affect the project at its roots. The second apprehension is that the state government may pull back from its commitment on delegating adequate funds for the maintenance of restored assets. (This possibility has, to some extent, been covered by a stipulation under the 10th Finance Commission.).

Government response: a critique

We cannot stop disasters from striking, but we can certainly minimise their impact. Mitigation measures in the past 20 years have changed in terms of both technology and response, given that the current rate of occurrence of cyclones is almost one every two years. In India, the benchmark is the cyclone in 1977 in Andhra Pradesh. Efforts were made not only to provide relief but also long-term measures.

Immediately following the 1977 disaster itself, only 15,000 houses were constructed, some of them qualitatively dismal. It has been noticed that whenever VIP inaugurations have taken priority

more pressing matters, hasty construction has rendered the quality substandard. Fortunately, the massive housing programmes triggered by the 1977 cyclone resulted in the construction of 2.5 million houses in Andhra Pradesh alone, most of them in the coastal area and for vulnerable groups. But while the housing norms formulated then and continuing to this day are aimed at giving priority to cyclone and other natural calamity victims, the allotting of houses in many places by the elected representatives is a picture of electoral distortion. Furthermore, thanks to the impractical deadlines set by government functionaries and the dishonesty of some officers and contractors, about 30 per cent of the cyclone shelters are unfit for occupation.

Two years ago, the Andhra Pradesh Academy of Rural Development (APARD) had surveyed the coastal regions, and some measures for repairs were taken. But the most basic elements of protection and accessibility to protection are still ignored. Approach roads to shelters, for instance, must be designed for emergency movement. Drainage clearance is a must in inundation-prone areas prone to minimise problems from waterlogging. The largescale drainage repairs by the AP government after the May 1990 cyclone in Andhra Pradesh did have a visibly positive effect.

The improvement of roads with the help of World Bank aid also facilitated faster evacuation and relief measures in subsequent cyclones and floods. Telephone and wireless communications have been strengthened. Remote sensing maps and GIS are utilised for identifying elevations for the construction of shelters and relief camps, and for assessing damages.

Saving lives or property

It is a moot point whether the emphasis of cyclone relief over the past 20 years has been on lives or property. The cyclone warning and response systems have improved a great deal. The government has begun to realise – if not exactly to implement – that it must concentrate on long-term measures with regard to road communication and other infrastructure such as safe drinking water. The relief administration is relatively better organised and better equipped – but its preparation is clearly episodic: it has been caught napping in areas which cyclones had given a miss for four or five years. Cyclone preparation – more a result of reflex and Pavlovian reactions to regular pounding – has

led to a reduction in human mortality, but property damage continues to be appalling. Crop losses have nominally decreased due to improved drainage facilities and advance planning, transplantation and harvesting. Rather late in the day, the advance stocking of medicines and vaccines has been discovered to be cost-effective and mortality-preventive.

Timely evacuation can reduce risks, but it is costly and socially disruptive in practise

The improved coordination between the Meteorological Department and the state Relief Administration, the flood control agencies and other agencies belonging to the Central and state governments has proved that mortality can be de-linked from the ferocity of a cyclone. While the wind velocity in the 1977 cyclone was 185 kmph, and the cyclone was restricted to parts of the two districts of Krishna and Guntur, the death toll was more than 10,000. During 1990 May cyclone, the wind velocity was 240-250 kmph and 10 districts were affected, but the death toll was only 900. The 90 per cent reduction in fatalities was because in 1977 there was neither an accurate warning system nor a communications network. Today, work has gone further: warning has been advanced considerably by satellite imaging.

Risks can obviously be minimised by so-called advance and timely evacuation. But it remains the costliest and socially disruptive of all preventive measures. We get 16 warnings or so every year, mostly during the monsoons. Which one will come to pass? How many times can one evacuate a sitting population, knowing that they will have to leave behind their belongings and return to devastation? Let us face it. Evacuation is expensive. It is not a feasible first option in all cyclones. Considering the considerable limitations of relief camps, indiscriminate evacuation should not be the quickest recourse. In this context, building proper shelters within a habitation and creating awareness in the people are equally, if not more, important.

Cyclone-resistant housing is an option that deserves greater attention. There is some effort going into research on core housing but far more focus is needed in this field. The Department of Structural Engineering at Roorkee University has designed excellent low-cost cyclone and earthquake-proof housing structures. It has also issued guidelines on minimum safety measures that cost a little more than the dilapidated measures now in use. The country has sufficient technology. The rest is a question of will and of resources.

But technology in itself is only one arm of the cyclone-detection and mitigation machinery. Bangladeshis, racked by some of the world's worst cyclones, can identify which wind should get them moving to the shelters. They take decisions regarding evacuation at the level of the Control Rooms at the Thana (taluka) level. In India, the hourly cyclone track map is not available even at the District Collector's office (see section on *Early Warning*).

Sensing cyclones should become reflexive. Disasters like cyclones and floods are usually location-specific. We should evolve our own systems of preparation and reparation, depending on our socioeconomic, geographical and even cultural backdrops. The government has done some unprecedented – but belated – work in Andhra Pradesh in the development of sustainable infrastructure. But it falls short of total requirements: it is a battle against financial stringency, and rarely accounts for the fact that the vagaries of nature are unpredictable and that dealing with them is an ongoing expense.

There are strategies that can be adopted locally. Apart from core housing, changes in cropping patterns and land-use can be adopted. The rice fields in West Godavari escape the destructive effects of the November cyclones because the people here are able to advance their kharif crop by using tanks and farm ponds for raising seedbeds. By spending a small extra amount per unit, we could make thousands of low-cost houses currently under construction cyclone-proof.

But radical changes have to be socioeconomically judicious. In Krishna district, the government had started and encouraged small fish tanks to serve the purpose of raising early seedbeds. But matters have got out of hand today: everybody is turning their fertile agricultural lands into fish tanks, resulting in pollution and other whiplash effects. Unless we are careful with such manipulations, the runaway effects of perceived short-term but unexamined advantages could be as disastrous as the disasters they seek to mitigate.

Relief, politics and voluntary efforts

The less said about the politics of relief and rehabilitation, the better. The diseases of ego, corruption and mismanagement endemic in national life infect this area with equal malignancy. In many cases, relief camps become a political necessity rather than

a "real" requirement with their own "real" dynamics. As national politics vacillates between "monolithiveness" and "associativeness", between stability and chaos, political interference in relief distribution is increasing as the disaster-afflicted are viewed as just another constituency to be nurtured. Donations, especially foreign donations, have begun to come in with more politicoeconomic strings attached. There must be focused public pressure, and corresponding state response and responsibility. The need of the hour is virtually heretical for the Indian government to contemplate: it is for the government machinery to move like an NGO – with compassion and commitment.

The first thing this will require is a change of perception: the government must recognise that NGOs have done excellent work in Andhra Pradesh. This must be followed up by the representatives of NGOs being included in the coordination bodies at all levels. This would, at the very least, give the NGOs an incentive to continue with developmental activities even during normal times. However, the tendency of the government to relinquish all responsibility once it is deemed to have been satisfactorily handled by other parties must be curbed: legislators and other elected members must take part in planning and review at appropriate levels. It's a long haul, but it's shorter than the horrendous path down disaster avenue.

'DEVELOPMENT WILL BE A NON-STARTER IF YOU DON'T FIRST REDUCE DISASTER RISK'

Interview with, Mr. M Sahoo, IAS, Secretary, Finance, AP

What are key strengths and weaknesses of the government's disaster management programme?

The present difficulty is in making people believe in whatever warning is given. At the same time, the warning system itself has to be technologically improved. Vulnerable groups, such as fishermen, have to be adequately warned. We plan to provide groups of villages with very high frequency communication (VHF) sets. We need to strengthen infrastructure where people live very close to the sea. Infrastructure improvement will lead to the area being well-connected.

The present World Bank funded initiative on disaster response is reported to be a bold, pioneering one. What prompted the government to take such a step?

The state was supposed to do a water and delta management project in the early 1990s. It could not be done by 1994. The 1996 cyclone further exposed the state's vulnerability to storm surge and flood. Now we are doing a new study and modelling.

How far has this project progressed?

Several necessary technical teams have been set up. We are trying to make data and maps available in order to facilitate better prediction. These teams comprise paid professionals from technical firms independent of the government. We are also undertaking a study of designs of strengths and weaknesses of the system infrastructure – roads, bridges, etc. We are checking if the design is adequate.

What is the budget of this project?

The budget is Rs 100 crores, spread over two years, including the (three) Doppler radar to be installed by the Indian Meteorological Department (IMD). Of this, 60 per cent of the money is for the Doppler radar, of which the Central government is planning to install three on the east coast of India.

How do you ensure that the benefits of these technological improvements reach the bottom end of the administration, where phones do not work and warning messages do not reach, as happened during the 1996 cyclone?

We have to depend on non-physical modes of transmission at the bottom end. There will be no one who can physically carry the messages at the windspeed of 150 kmph. You have to go in for wireless. Moreover, the non-physically-sent message should have credibility. We have to depend on high frequency communication. We have a plan to link the mandals through a computer network. In two months time (by August 1999), taluka-level computerisation work will be finished.

How does the government place cyclone disaster management in the context of the overall development of the state?

First you have to mitigate disaster risk. Otherwise, development will be a non-starter. We are trying to assess the risk factors and address the vulnerabilities.

How does the government ensure NGO participation and community involvement?

The involvement of the community does not necessarily mean NGO participation. We do not prescribe any model for community involvement. Any group can come forward – whether it be a self-help group, a panchayat body, a group of mothers, or anybody. If there is a local NGO that can catalyse social mobilisation, all the better.

Does this new initiative mean shake up all the levels of bureaucracy that could be slow or unresponsive?

It does not involve so many levels of bureaucracy. What we aim at is to ensure better dissemination of high-level knowledge. Second, the project involves direct communication with people. It is all about ensuring a safer life for people. I do not see any resistance against that.

Please explain the concept of the Vulnerability Reduction Fund Trust.

We are doing many things under this project to make people's lives secure and safer. This programme will attempt to leave something that could be used in the long run. We are creating the corpus of a fund which will aid any people-centred activity that aims to reduce risk. People have to decide the activity they would like to have in their area. For example, in some areas, cyclone shelters are constructed but not maintained; some people want to have mangrove plantations to reduce the impact of a cyclone; others want to build a bridge to connect their deltaic village to the mainland, so that the evacuation becomes easier.



7

Early Warning: Issues of Concern

CYCLONE TRACKING

Cyclones are creatures of complicated climatic whimsy, but there is no other option to early warning to save lives and material. And predictive possibilities are getting better every day

One of the most crucial aspects of cyclone disaster management is early warning – it is central to preparation and self-protection, the mobilisation of resources already at hand and those in abeyance, at the community, state and Central levels, and in proactive evacuation. Despite the considerable guesswork attached to meteorological science and weather prediction, cyclones can be forecast, pinpointed at inception, tracked and monitored with enough accuracy for damage to be minimised. Existing technology allows officials in charge to know of a cyclone's formation, possible course, and location and time of landfall well in time to call in fishing boats and warn people on land.

India's cyclone plan, such as it is, consists mainly of work by the Indian Meteorological Department (IMD), as the principal agency for cyclone-related developments: monitoring, data collection and data dissemination to all concerned through the Area Cyclone Warning Centres (ACWC) and Cyclone Warning Centres (CWC).

The IMD tracks cyclones with the help of: ¹

¹ Mandal, GS, 1994, *Natural Disasters in Disaster Management*, (Ed) Vinod K Sharma, Indian Institute of Public Administration, New Delhi, pp 168-79

- Regular observations by IMD's own weather network surface and upper air observing stations
- Reports from ships: About 280 merchant ships are equipped with meteorological equipment. Foreign ships passing through Indian seas are expected to feed the nearest meteorological offices frequently with weather data
- Cyclone detection radar: Ten radars have been set up along the Indian coast, including in Visakhapatnam and Machilipatnam
- Satellites: One of the cyclone detection's most dependable tools. IMD monitors data from India's geostationary INSAT 1B and certain foreign satellites
- Reports from commercial aircraft (advanced countries use aircraft reconnaissance to track tropical cyclones),

The important components of cyclone warning are the forecast of the future path, intensity and the associated destructive weather systems

The important components of cyclone warning are the forecast of the future path, intensity and the associated destructive weather systems. The IMD's early warnings are routinely made use of by ships, the Indian Navy, port authorities, commercial aviation bodies, the Central and state governments, fisheries officials, fishermen, special warnees and the general public.

The early warning system is, in fact, the starting pistol for subsequent administrative actions. Although it is quite efficient, there are some areas that could stand improvement, as the CDMC's report of 1971 suggested. The present EWS comprises 10 radar stations covering the Indian coastline – six on the east coast and four on the west coast. While the radar are not the most powerful compared to contemporary radar in use in the US, their range of 400 km, along with their judicious emplacement, ensures that no cyclone goes undetected in the Bay of Bengal. In addition to the radar, a satellite-based Disaster Warning System (DWS) system, based on geostationary satellite communications, has also been established at 100 locations in coastal Andhra Pradesh.

CELESTIAL VIGIL

An orbital viewpoint provides predictive space and advance mitigation planning opportunities

Satellite imagery has unlimited disaster prediction and mitigation potential – coupled, of course, with the right governmental attitude. Terrain evaluation and analysis by satellites – both continuously beamed and timed photographs – has become intrinsic to meteorological study. More satellite time is devoted today to weather and geography scrutiny than to any other field, except perhaps communications.

A satellite offers repetitive coverage, making it possible to examine particular locations at regular intervals. Remote sensing data and techniques can be used in all three aspects of disaster management – vulnerability assessment, Disaster Warning System (DWS), and damage assessment. Furthermore, it can be applied to all types of natural hazards – floods, drought, storms, cyclones, landslides, crop failures, forest fires, volcanic eruptions, earthquakes, and so on.

Remote sensing continuously provides visual and infrared pictures of cloud development, as well as land-sea temperature details and differentials. Combined with data on other meteorological features like wind velocity, it is possible to forecast cyclones, sometimes by days. As in Gujarat recently, advance cyclone warning helps in evacuation and in limiting the nature, extent, and magnitude of human and material damage. Satellite imagery is a fast-upgraded technology and next-generation satellites have been designed with newer features.

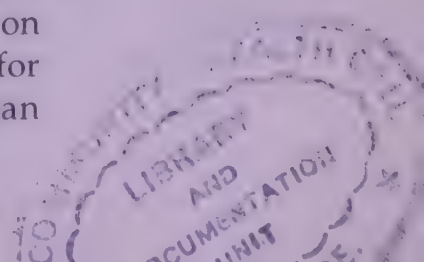
Satellite coverage supplements radar reach, but in time the very reverse will be the norm. Today, with the satellite coverage of the Indian Ocean, it is possible to detect well in advance pre-cyclonic disturbances as they form in the Bay of Bengal, even if they are out of the range of radar. DEW messages, although usually being shot off by the CWC according to agreed schedules, sometimes prove laggardly – unfortunately, particularly those crucial messages when the storm is close to landfall. The CWC itself needs between two to three hours to study the meteorological data from other stations along the coast and formulate a reasonably reliable warning message.

Warning lapses

Inevitably, there is time lost in the actual transmission of the message by telephone, telegraph and wireless, and its collection or reception. The state Contingency Plan also mandates that the warning messages be repeatedly broadcast on all wavelengths on All India Radio. But the fact is that some Control Rooms fail, for whatever reason, to send out first information reports. Indian

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fishing boats are also largely unequipped with wireless transceivers, and even those with radios often do not have proper wavelength reception. Moreover, the culture of listening to broadcasts is an inconsistent one among fishermen even in normal times. This goes a long way in explaining why hundreds of fishermen were trapped out at sea in the November 1996 cyclone and never made it back to shore.

During visits to the districts, we have observed that Control Rooms do not secure for themselves maps of the coast that would enable them to mark a cyclone's path in parallel with the messages received from the CWC. It would obviously be more profitable under the circumstances if the warning messages were to be plotted on the national map, and the advisories given in the text interpreted by the District Administration so that they are in a better position to assess the future course of a cyclone.

This in no way diminishes the importance of the Control Room staff at the district headquarters being knowledgeable and informed enough to make their own assessment of a cyclone's progress and future course. The ultimate decision to order evacuation rests with the District Collector, but it is a responsibility so fraught with threat of political accountability in case of overkill or false alarm that it is often a duty delayed or denied. More often than they are comfortable with, the IMD's officials are collared for advising evacuation when a cyclone either misses a particular stretch of coastline or strikes another. In such a case, the people blame – with enough reason, as far as they are concerned – the authorities for "overreaction".

During the study on the cyclone of 1996, the impression given by some district officials was that they had been depending on the CWC to narrow down, or at least sharply delineate, the cyclone's likely target area. The initial forecast for landfall was between two points, Ongole and Visakhapatnam, covering six districts and separated by many approximately 600 km. As the cyclone loomed closer, the point of impact was given as between Machilipatnam and Visakhapatnam, covering four districts; this was followed three hours later by an assessment of the crossing as between Machilipatnam and Kakinada, covering three districts.

This vacillation of crosshair reinforces the fact that it is difficult to predict the path of a cyclone and its point of landfall, and there is

little that the IMD can do to bring some precision to bear on the issue. Tropical cyclones are characterised by their extreme unpredictability. Despite the fact that their erraticity can be apprehended by intelligent computer modelling, uncertainty remains about cyclone direction and speed, and the growth dynamics of weather have not yet been entirely comprehended. While the IMD advises the acceptance of meteorological error as a fact of life, it is tough for the repeatedly cyclone-affected to understand the logic of statistical error and weather dynamics.

Pinpoint accuracy of the path of a storm has not been possible, even in the US, with all its technical expertise and satellite coverage. So, jumping the gun, as it were, could do more harm than good. Although satellite pictures are available from the low-pressure stage onward, it could be premature to key up those responsible for issuing public warnings before determining the intensity and direction of a cyclone.

Once the intensity and direction of the cyclone are known with the aid of radar data, the alerts are issued, upgraded regularly to a series of warning messages disseminated at periodic intervals, till the cyclone finds its logical end either after crossing the coast or fizzling out at the sea. Improved communications now allow us to send and receive messages in ample time to contain casualties, if nothing else. Reality, however, exists at a different level of response: there are excruciating delays, causing confusion at the district level. Experience during the November 1996 cyclone showed that crucial messages were missed or delayed, sometimes long enough for their utility to be lost to the recipients, as with the Collectorate at Kakinada.

Pinpoint accuracy of the path of a storm has not been possible, even in the US, with all its technical expertise and satellite coverage

A perusal of the nine messages received at the Collector's office is damning: it shows that there were delays at each stage of the process of the message – from observation, analysis, the origin of the warning, transmission, delivery, and receipt at the destination. *(The alert and warning messages received at Kakinada are tabulated at Annexure-A on page 109).*

The time intervals in the sequence of the formulation of the messages were studied from extracts of the nine messages given in Annexure- A. They were then placed in four main stages, given in Annexure-B on page 110 and are summarised below:

- Stage 1:** Locating the disturbance, analysis of data, and formulation of the alert/warning message. Time taken is between 30 min to 3 hrs 30 min.
- Stage 2:** Handing of the message to the wireless station/telegraph office. Time taken is between 35 min to 4 hrs 10 min.
- Stage 3:** Transmission time – from origin, to Time Handed In (THI) – 35 min to 4 hrs 30 min; from THI to Time of Input (TI) – 10 min to 55 min; from TI to Time of Delivery (TD) at the destination wireless set – 26 min to 6 hrs 30 min.
- Stage 4:** Receipt by the Collectorate. Time taken – 1 hr 55 min to 10 hrs 30 min for wireless, 4 hrs 30 min for telegram; only four messages have time of receipt recorded on them. The other five messages do not have endorsement of time of receipt on them on file.

Observations on warning messages

The CWC needs time to collate and scrutinise all the data collected, and can begin to disseminate alert/warning messages only after analysing the data. The Director of the CWC needs to look into the time taken to do so, and to seek ways to reduce it. It seems eminently possible: there is an example of a message being originated in 30 minutes (*please refer to Cwb 3 / 4 under the Type / MSG No. column of both the annexures*). For reasons unknown, this message was sent not on the police channel but as a telegram: it was handed in at 1910 hrs on November 6 after 4 hrs and 10 min.

The delay was compounded when the message could not be conveyed to the Collectorate as the telephones were out of order. At this point of time, rain had already commenced at Kakinada, indicating that the cyclone had crossed the coast. Clearly, had this message been conveyed on the police channel, it might have reached the Collectorate much earlier. The following points are for consideration:

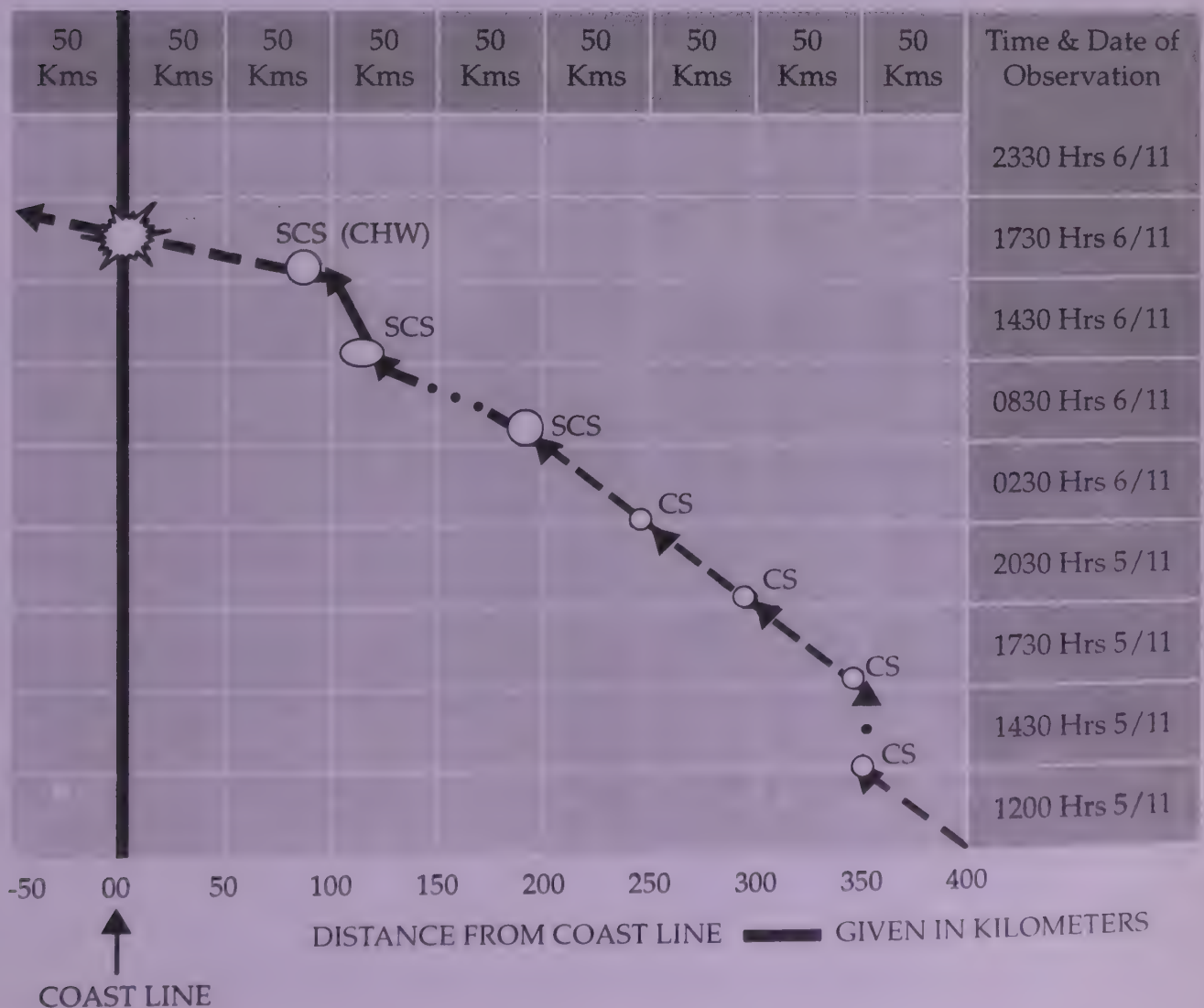
- The time for handing in the message can definitely be reduced.
- The time of delivery at the receiving wireless set and the collection of the message by office staff at the Collectorate can be reduced.
- The use of a hotline between the collectorate and the CWC, or that of a fax, should be considered. NICNET is another possibility.

Comments

A simple graphic presentation has been made to show the time and space relationship between the time of observation by the CWC and the cyclone's locus identified as its distance from the coast (*see Graph*). Officers manning the Control Rooms are never in a position to assess a cyclonic system's spatiotemporal relationship, in the absence of maps in the Control Rooms showing the coastline and the grid markings of latitudes and longitudes.

We suggest that besides an enlarged map of the district(s), there should be a map showing the entire coastline of India and the coast of Bangladesh and Myanmar, and including the Andaman & Nicobar Islands and Sri Lanka, to aid following the warning

TIME AND DISTANCE PLOT OF IMPORTANT WARNING MESSAGES FROM CWC-NOVEMBER 1996 CYCLONE



messages in a meaningful manner. The first advantage of this map would be that the Control Room staff could at a glance review the previous messages from the map without having to refer to the long warning messages, in the interests of time and precision.

The second advantage would be that a reasonably informed and proactive assessment could be made of the likely future course of a cyclone without waiting for a fresh bulletin from the CWC. This is not to deny the likelihood of the cyclone demonstrating a mind of its own – maybe even in the majority of cases – and defying the assessment. But as a cyclone approaches the coast, its likely deviation from the charted path can be placed in a narrower bracket, giving the district authorities that much more lead time to make a decision to evacuate or otherwise, or any other action.

The horizontal axis shows the distance from the coastline in blocks of 50 km each. The coastline is depicted as “0”. On the right hand side at the bottom are the timings and dates of messages given, starting at 1200 hrs on November 5. The dotted line in the grid refers to the time interval between the observations and the distance travelled by the cyclone.

We shall trace the distance-time sequence from the point of entry into the radar range of 400 km in the table given:

Time sequence of observations	Time interval (in hrs)	Distance travelled (km)	Translation speed (kmph)
1200–1430	2 +	50	20
1430–1730	3	0	0
1730 (5/11)– 0830 (6/11)	15	150	10
0830–1430 (6/11)	6	80	13.33
1430–1730 (6/11)	3	20	6.66
1730–2330 (6/11)	6	150	25
1200 (5/11)–2330 (6/11)	35 +	450	12.67
			(Average speed from 1st to last observation)

The table is clear evidence of the unpredictability of the speed of cyclones, and also that cyclones tend to increase in translation speed the closer they get to the coast. Spatiotemporal information is essential in order to arrive at a decision to order evacuation or not to. And so is mapping at the Control Room, if only to increase the lead-time for the percolation of orders to the lower levels.

It is also evident that most messages contain all the essential information for dissemination to all quarters concerned – from other officials to potential victims. Increasing awareness among officials and the lay public also facilitates the easy translation of the text of the messages, saving some time in transmission at all levels and facilitating compliance.

The issue of installation of Dynes Pressure Tubes at important places along the coast must be positively entertained. This is a wind recording instrument for speed and direction and provides a graphic picture of the progress of a storm. At present, high-speed wind recorders are in place at only Visakhapatnam and Machilipatnam in Andhra Pradesh.

One of the suggestions made by the CDMC is the deployment of a reconnaissance aircraft fitted with meteorological instruments to record actual and developing weather conditions and thereby improve assessments. The National Hurricane Center in the US is equipped with such aircraft, and they play a big role in warning and in turn early evacuation and in keeping cyclone deaths in the US the lowest in the world. "India does not as yet have a cyclone reconnaissance aircraft, and no country in the world needs it more" some experts opine.

As regards the accuracy of observation, the IMD is believed to be going in for upgradation of the radar to Doppler-type, which would assuredly enhance their assessment capabilities. But we will have to keep in mind that it may not be possible, in the foreseeable future, to proximate the level of accuracy as desired by the public and officials. The long-term outlook should be to strengthen the capacity of the people by protective planning – building cyclone-proof houses and minimising the damages by improved structural works.

Pending strong architecture, however, evacuation is probably the most logical – though certainly the most disruptive – of short-term proactive measures. But it will always carry the taint of a knee-jerk response, even where possibly undeserved. People are naturally reluctant to abandon their houses because of the lack of security of their properties and also because of a native disbelief in government warnings, reinforced when the cyclone in question sometimes providentially misses the target.

Cyclone management at present is of the "push-push" type: the administration pushes the people, and the people push back

But this reluctance can be worked around: during the November 1996 cyclone, villagers in Sakinetipally Mandal refused to move out of their seaside village, separated from the mainland by a water channel. The Mandal Relief Officer found the people adamant even when he threatened to evacuate them by force. Fortunately, the cyclone gave the area a miss. One month later, again confronted by a threat of cyclone, some people from the very same village came to the MRO, informing him that all the villagers had crossed the water channel on their own, and wanted to know which relief camp they should go to. The experience of the Mandals further north along the coast, which had been hit by the earlier cyclone, had taught them the value of apprehension.

In official quarters, too, lessons seem to have crept in. Training programmes are organised for district sectoral officers by the Andhra Pradesh Academy of Rural Development (APARD) in Hyderabad. They are taught about the formation, characteristics and effects of cyclones by a retired Director of the Meteorological Department in Hyderabad. Similar training is also imparted to many more district officers at the district headquarters of all the coastal districts prior to the cyclone months.

Cyclone management at present is of the “push-push” type: the administration pushes the people, and the people push back. It is a confrontational approach to proactive disaster management that will have to be replaced by a government and people’s procedural unity. Anything less will not work.

Annexure-A and Annexure-B follow on page 110 and 111.



ANNEXURE - A

CYCLONE ALERT / WARNINGS - 5/6 NOV 1996

TYPE/ MSG No	Origin at CWC VSP	Location of Cyclone	Direction	Crossing on the coast	Rainfall	Wind speed in kmph	Advisory	Remarks
Alert 2 Thi 18:05	17:00 5/11	16 N 86E 350 km SE Vsp 1430 h 5/11	Westerly	Ong-Vsp 6th Night	Most places Hy V Hy Nlr. Pkm. Kis. E/C, W/W, Vsp, 5th Night	65-75	Warn all concerned	Thi 05 18:17 Tdl 05 18:54
Alert 3 Thi 2250 Ser 5	2030 5/11 3:00 AM 6/11	16N 86E 350 kms SE Vsp 1730 h 5/11	Westerly	Ong-Vsp 6th Night	Most places Hy V Hy Vsp, Gr. Pk. Nlr 6th Morning	65-75	Subsequent Warnings on AIR VSP, VZA, CDP, HYD.	Thi 05 23:05 Tdl 06 00:44 Tgm for KKN
Cwb 1 Thi 0003 Ser 6	2230 5/11/96 rcpt 4:45 am	16N 85.5E 300 km SE Vsp 2030 h 6/11	Westerly	Ongole - Vsp 6th Night	Most places rain Hy-V/Hy E/go. W/go Kis. Gr.	65-75	High sea fisherman not to go trees kutcha houses damage	Thi 06 00:19 Tdl 06 01:06
Cwb 2 Thi 06:35 Ser 7	06:00 6/11 11:00 am	16N 84.5 E 250 km SE Kkn 0230h 6/11	Westerly	Ogl-Vsp 7th Morning	Most places HY-V/Hy few Vsp, E/go, W/go Kis. Gr.	70-80, 6th afternoon	Floods High sea, Fisherman not to go Trees breaking Kutcha houses damage	Thi 07:30 Tdl 08:15
Cwb 5 Thi 13:05 Ser 8	12:00 6/11/96 15:00	16N 84E 200 km SE KKN 08:30 h	Westerly	Ogl-Vsp 7th Morning	- do -	90-120	Uprooting trees Fishermen great danger signal 10 bmi. VSP, Kda, Mtm, MPm Velaveru	Thi 13:15 Tdl 13:31
Cwb 3/4 06 19:10 Tgm	15:00 6/11	16.4 N 83.0 E 100 km SE KKn 1430 hrs	West-North westerly	MCP-VSP 6th Midnight	- do -	120-150	Widespread rain Households uprooting of trees lowlying area flooded disruption common Tidal wave 2 to 3 mtrs	Tgm was not conveyed as phones were 0/0. Note on tgm.
Cwb 4 (Vsp) 5 (Dists) Thi 06 19:10	18:30 6/11/96	16.3N 82.7E 100 Km SE Kkn 1730 hrs 6/11	Westerly	Mcp-Kkn 6th Midnight 7th Morning	- do -		Houses damage, Disruption, Communications. Uprooting big trees, Tidal Wave - 2 Mtrs	Thi 06 19:21 Tdl 06 22:01 When received ?
Cwb 6 Thi 07 01:30 Ser 8	00:30 07/11/96	50 km SW Kkn 23:30 hrs 6/11	West North Westward	Crossed NW Andhra Coast S of Kkn	Most places Hy -V. Hy E & W Godavari Dists	60-90	Damage Kutcha Houses, Breaking Tree br Sea High, Fishermen not to go out. Gr Danger Sig 7 at Kkn E&W Godavari dists advised Evac from owlying coastal areas	Thi 07 01:30 Tdl 07 08:00 Note ascertained on phone from cwc
Cdwb 2 Thi 07 1300	1100 7/11	0830 7/11 50 km SE Khammam	West North westerly		Rain Continues Hy - V/Hy rain continues next 12 hrs	45-55	Rainfal many places Hy-V/Hy rain continues next 12 hours. No further bulletin will be issued	Thi 1257 Tdl 1639

ANNEXURE - B TIME SEQUENCE FOR ORIGIN AND RECEIPT OF MESSAGES - CWC (VSP)

TYPE/ MSG No	Location of Cyclone at	Origin at CWC VSP	Time handed in / input / delv		Received at Collectorate	Observation to origin - msg	Origin to THI	THI to receipt at Collectorate	Remarks
Alert 2	1430 h 5/11	1700 5/11	1805	1817 1854	Not known on file	2h 30 m	1h 05m 0h 12m 0h 37m	Not known	
Alert 3	1730 h 5/11	2030 5/11	2230	2305 0044		3h 00m	2h 00m 0h 35m 1h 39m	4h 30m for Tgm 10h 30m for police wrls	
Cwb 1	2030 h 5/11	2230 5/11/96	0003	0019 0106	4.45 am 6/11	2h 00m	1h 33m 0h 16m 0h 47m	4h : 42m	
Cwb 2	0230h 6/11	06:00 6/11	0635	0730 0815	1130 am 6/11	3h 30m	0h 35m 0h 55m 0h 45m	4h : 55m	
Cwb 5	08:30 h 6/11	12:00 6/11	1305	1315 1331	3 pm (1500) on file	3h 30m	1h 05m 0h 10m 0h 26m	1h : 55m	
Cwb 3/4	1430 h 6/11	15:00 6/11	<u>IOB</u> 1910	<u>TOR</u> 1945	Not known only telegram	0h 30m	4h 10m 0h 35m	Not known	Only Telegram not on automex Note ref. No Ref by Collectors report
Cwb 4 /5	1730 h 6/11	18:30 6/11	1910	1921 2201	Not known on file	1h 30m 01h 00m	0h 40m 0h 11m 0h 40m	Not known	Msg appears to have been collected / delivered much later
Cwb 6	22.30 h 6/11	00:30 07/11	0130	0130 0800	Not known on file	2h 30m	1h 00m 0h 50m 6h 30m	Not known	
Cdwb 2	0830 h 7/11	1100 7/11			Not known on file	0h 30m to 3h 30m	2h 00m to 3h 39m	Not known	
Range of time span									0h 35m to 4h 30m tgm 10h 30m pool wrls

8

Response of Civil Society

A QUESTION OF WORKING TOGETHER

A cyclone scatters and throws to the winds organisational coherence and cooperation as much as it does with lives and livelihoods. But it is the disunity of community, CBOs, NGOs, INGOs and the media that we cannot afford

Melting pot

The history of disaster response in India is a study of uniformity of intent but biformity of activity: the two prongs of governance in practice, government and civil society, are hampered by their own agendas. On the one hand, a resource crunch has rendered governments, both Central and state, inadequately capable of routine operations and maintenance. Communities, on the other hand, have "chosen" to relinquish their responsibilities to the government to maintain the community assets.

Over the decades of India's development rollercoaster, this self-abdication of both the government and civil society's responsibilities, has resulted in an over-dependence on the government for all kinds of assistance, especially after a disaster. It has made for desperation on the one side, complacency about accountability on the other. Any government's primary obligation to support social stability can hardly be compromised without societal disruption, but the Indian government has not developed any contemporary system to involve communities in its own functioning, even where its work vis-a-vis them is concerned. What has emerged is a disturbing, and eventually destabilising,

A paradigm shift is required to evolve sustainable disaster mitigation at the local level. But such a re-orientation demands that projects "for the people" become programmes "with the people"

situation where the community (or the "end user" in market terminology) does not perceive community assets as its own and is discouraged by extension to feel a sense of ownership and commitment.

A paradigm shift is required to evolve sustainable disaster mitigation programmes at the local level. But such a re-orientation demands that projects "for the people" become programmes "with the people". Local communities will have to play a crucial role in evolving long-term mitigation strategies that would essentially try to bridge the grey areas between relief and social development.

The government will have to change its oracular mindset while designing a disaster management policy for the state. Self-governance at the micro-level will have to find ways and means to tap the capacity of the community. The concretising of community participation in disaster mitigation lies essentially in strengthening local expertise, local institutions, local concern for vulnerability, and local ownership in mechanisms that address disaster issues. Community involvement is crucial in ensuring a culture of disaster preparedness, prompt response to warning, and efficient relief work. While community participation is essential in rebuilding damaged houses and other structures, it may be the only way to rebuild the broken psyches and lives of its people.

Andhra Pradesh has a history of local agriculture communities contributing toward the cost of repair and maintenance of canals and drains. As "Sramadanam" (community works), an initiative under the government's "Janmabhoomi" (motherland) programme proved, communities can be mobilised for ward cleaning, ensuring general sanitation standards, repairing drinking water sources, and nurturing trees.

The Janmabhoomi programme, a people-centred development process, was started in January 1997 by Chief Minister Chandrababu Naidu. It evolved from the experience gained through the Prajala Vaddaku Paalana (taking administration to the doorsteps of the people) programme launched in November 1995 and Sramadanam (contribution of labour) launched in January 1996. Janmabhoomi aims at establishing an ideal society,

one that embodies and cherishes the principles of people's participation, equality, transparency and accountability, an amalgam leading to sustained economic development and excellence in all possible walks of life. The five core areas of Janmabhoomi are:

1. Primary education
2. Primary health and family welfare
3. Environment conservation
4. Responsive governance

A community-based participatory risk audit should ideally have the following components:

1. It should be a timebound, multi-sectoral approach
2. A combination of community and specialist should analyse risk and its causes
3. An outside specialist's role should ideally be limited to bringing case studies from other communities and at the most an advisory role
4. Risk- and resource-mapping should include identifying vulnerable spots, sections of people, and hazardous activities. It should involve the use of innovative methods such as participatory rural appraisal (PRA)
5. Matters that have to be addressed should be listed on a priority basis
6. All community stockholders should be engaged
7. There should be an evaluation of existing disaster mitigation-related development activities, and their strengths and weaknesses
8. Measurable vulnerability reduction indicators should be developed. This would help in monitoring new programmes and help find their strengths and weaknesses

EXPLAINING CYCLONES PUTTING IT TO THE PEOPLE

There is a huge gap between warnings issued and warnings taken note of

Prior to the 1996 cyclone, there were regular warnings through All India Radio (AIR) about impending storms. But, says Mohan Raju, the local chemist in Balusuthippa village of East Godavari district, "We did not take the warnings seriously. If lay people had come and explained to us about the seriousness of the matter, we would have listened."

"A gale speed of 100 kmph" or "a deep depression developing 200 km south west of Visakapatnam" would quite likely sound vague – or even a rattle of gibberish – to a fisherman. If the devastating impacts of such a storm were explained in detail in simple language, the fisherfolk would equally likely have acted accordingly. Says Mohan Raju, "Or if someone had gone to sea with a motorboat, the fishermen could have come back."

Outlined below are some relatively rare examples in Andhra Pradesh of the civil society's truly effective involvement in disaster mitigation.

Sravanti (Tallarevu, East Godavari)

Sravanti is a small NGO that works in 10 villages with support from Oxfam, the British Department for International Development (DFID), and the UN's Food and Agriculture Organisation (FAO). It runs a healthcare system established with voluntary help from a young doctor, Ch Simhachalam, who hails from Neelappalli, a fishing community village in the area. Sravanti has its own cultural team that travels from village to village performing street plays.

Sravanti is working on issues related to coastal villages in Tallarevu, I Polavaram and U Kothapalli mandals in East Godavari district. The organisation supports collective action among fisherfolk and building the capacity of women's groups through thrift and credit, health education and environmental education.

Sravanti's healthcare set-up, the CDHADP (Community Development through Health Action and Disaster Preparedness) project, is funded by the European Community Humanitarian Office.

A. Srinivasa Rao is one of Sravanti's two healthworkers who worked during the 1996 cyclone. He recalls that in the aftermath of the cyclone, he worked in three villages frantically treating hordes of villagers with injuries, and, later, diarrhoea. "Many people had fractured their hands or developed sprains in their backs and shoulders," he says. "Many had fallen down while fleeing to safety."

The efficacy of self help groups is being appreciated of late

"After a disaster, the main problem is with the water," he adds. Under the unhygienic, crowded conditions in the makeshift dwellings and relief camps, people throw wastewater indiscriminately all over, often contaminating their own water sources. "I suggested that they boil the water before use."

Storm Safety Action Groups (SSAG)

Storm Safety Action Groups (SSAG) are village self-help groups. Just before the "cyclone-months" of April and September, each village selects a team of 25 members to be trained in warning, dissemination, rescue, shelter management and first aid. Such groups are formed in 64 villages with the help of the NGO community and the Andhra Pradesh Fisheries Department.

The NGOs have taken their cues from donor agencies, which have been emphasising the need and efficacy of self-help groups. Earlier, the Food and Agriculture Organisation (FAO) had provided floats, lifejackets and outboard boat engines to the people. Many villagers, however, were ignorant of how to use them. That this is a persistent problem was evident when the issue was raised at a recent seminar organised in Bangalore by AFPRO.

A direct result was the SSAGs. Oxfam has already held a 21-day-long storm safety officers training programme, participated in by two men from each village. The trained personnel were to return to their villages to train entire teams.

WEAVERS' REHABILITATION

SAKTI (Search for Action and Knowledge for Tribals), (Amalapuram, East Godavari)

Dr Sivarama Krishna, an anthropologist who studied the Konda Reddy tribes in East Godavari district, started SAKTI in 1985.

SAKTI's strength has been a thorough understanding of administrative and legal procedures, which it has used to ensure that tribals derive due and effectual benefits from the law. After the November 1996 cyclone, SAKTI did a detailed survey of weavers' communities in the area. On the basis of its findings, support was provided to carry out the reconstruction and retrofitting of houses. SAKTI also focused on playing a facilitative role in organising the weavers' communities into cooperatives, and to explore other avenues of marketing of finished products. A series of awareness camps on disaster preparedness and mitigation has been held over the past one year.

Amalapuram was one of the worst hit areas during the 1996 cyclone. Sakti, an NGO, works among weavers who lost their homes and their trade during the cyclone. As principle and policy, Sakti does not believe in dole-outs, but in issue-based support to village activities. After the cyclone, for instance, it had provided material and money for 103 "retrofitted" houses constructed to withstand strong gales. Retrofitting was done by placing strong, thatched roofing on two 12-ft high concrete pillars and tying them down with metal wires. The pillars also supported the 10-ft walls of the houses with the help of a beam.

How safe are retrofitted houses? It is a question that continues to dog the issue. It is inarguable that they are a much better alternative to the earlier thatched huts. Many retrofit designs are certified by NGOs such as ARTIC (Appropriate Reconstruction Training and Information Centre). However people still harbour their doubts. Says Ganesh, "If a cyclone like that of 1996 were to come, we do not know what would happen."

The point missed while this argument does the rounds is that when the cyclone hit, the weaver community in Amalapuram was entirely unprepared for it. Says Vastrala Tulasi Ganesh, a Sakti worker and an expert in engineering traditional looms, "We heard about the cyclone over the radio two days before it struck. But we never knew that it would affect us. Warning flags were hoisted at Machilipatnam and Visakhapatnam, but we never thought it would hit here. There was no information that we should be very careful." It's a familiar complaint, say NGO activists.

The weavers' colony of 350 families in Pulledikuru village in

Amalapuram mandal produces, on an average, 200 handloom saris a day. A handloom weaver family earns about Rs 1,200 a month. During the 1996 cyclone, the weaver community suffered major losses as unfinished products and looms were damaged by collapsing houses. In the rain and flood, unfinished clothes lost their starch. The popular "pit looms" became useless, their pits flooded. (A "pit loom" is so named because it is inserted into a hole dug in the house floor, enabling the weaver to operate it with her/his legs while sitting on the floor.).

The event devastated them: many weavers already owed up to Rs 36,000 each to the master weaver, the man who traditionally controls the community's business. The collateral was wrecked, making it impossible for them to get more credit. Moreover, there were not enough trained carpenters in the area who could make new looms. Many families had to migrate. But when Shakti intervened, helping people with afford new looms and build new houses, many of them returned.

Even obtaining bank loans was difficult, as the weavers were in no position of offer guarantee or security, say NGO activists.

Obtaining bank loans (for weavers) is difficult, as there is little they can offer as guarantee or security

Balusuthippa (East Godavari)

Balusuthippa is located on an island on the southern branch of river Gautami Godavari (Vrudha Godavari) and faces the mouth of the river. Balusuthippa comprises three distinct groups of colonies: Kothapeta, Madhyapeta and Paturu. An estimated population of 14,247 (post-1996 cyclone FAO study) makes up 1,745 households. Of the total number of houses, 5 per cent are of concrete, 8 per cent are tiled and 87 per cent thatched. The literacy rate is 7.4 per cent. The health services are extremely wanting, general hygiene and health conditions are entirely unsatisfactory. Three open tanks comprise the total drinking water sources in the village.

During the November 6, 1996 cyclone, most of the thatched houses were unsalvageably damaged and most tiled houses were partially damaged. 80 per cent of the 375 deaths reported in the village were at shrimp seed collection sites near the sea. Balusuthippa received no cyclone warning. Relief works here started three days after the cyclone. Regular compensation was, politely put, given "eventually".

COMMUNITY EFFORTS

ARTIC (Appropriate Reconstruction Training and Information Centre), (Chinnapetta, East Godavari)

ARTIC is a secular and non-profit organisation that promotes community development to improve standards of living of the rural poor in Andhra Pradesh.

Chinnapetta is a deltaic village wedged into a fork in the Gowthami-Godavari river, which whimsically shifts its path every monsoon before its two branches merge again at Yanam downstream. The boats that ferry people from the mainland to the village come in handy during the heavy rains and ensuing floods to transport people from house to house. During the cyclonic years of 1986 and 1996, the village witnessed heavy floods, says M Suryababu, a *gram sevak* working with the NGO, ARTIC.

Suryababu recalls that the 1996 cyclone had claimed three lives in Chinnapetta. The villagers had largely been marooned. "There was no place to go for food, no way to go either. We had nothing to sleep on." But the community helped out those who lost their houses. Many people contracted dysentery before aid workers arrived in three days, and a medical team in seven days, with bleaching powder and oral rehydration solution (ORS).

Chinnapetta's neighbouring village, Peddapetta, has one more worry – a river that inches closer to the village day by day. The swift Gomati-Godavari river is fast eroding the banks along Peddapetta. Chunks of earth, trees and all, topple into the river due to the erosion. During the monsoon, the river turns ferocious, with its waters spilling over. By the times the floodwaters recede, the river would have captured more of village land.

Rajagulapetta, East Godavari

Rajagulapetta is a small *dhobi* (washerfolk) hamlet of 20 families. The thatches of their houses were blown off during the 1996 cyclone. ARTIC began constructing 18 houses in March 1999. The villagers contribute free construction labour by turn. Five persons work on each house, of them one male and two female workers

being volunteers from the village. The two masons are paid workers. Of the total construction cost of Rs 35,000 per house, ARTIC gives Rs 10,000 and an additional Rs 2,000 for the latrine. The government chips in with Rs 17,500 in cash and construction material.

The villagers have certain problems. The local bank refused to open bank accounts for some families who could not deposit Rs 500 to open their account. Without an account, they could not receive the government's portion of the money. ARTIC, however, provided a loan to those who did not have the initial deposit amount.

MEDIA RESPONSE: BEYOND HUMAN INTEREST

Interviews with Senior Journalists in Hyderabad

Although the aftermath of a cyclone is a reporter's opportunity and nightmare, the pen wielded without over-reaction can actually facilitate action

When the 1977 cyclone tore through Divi Seema in Krishna district, R J Rajendra Prasad was a cub reporter. Now the bureau chief of *The Hindu*, Hyderabad, he recalls walking with Capt. AVS Reddy, an IAS officer in Andhra Pradesh, amidst dead bodies to cover the story of the tragedy in barely-sufficient 600-word despatches. "It was a daunting task," Prasad says, recalling the days he survived on tea, soda and bananas while the villagers survived on little more.

The cyclonic winds were devastating. "I saw telephone poles bent at 90 degrees," he says. The 4-ft high storm surge which heaved 4 km inland left little chance of human survival. Still, there were stories of human grit. "A woman," he recalls, "had survived by climbing a coconut tree, which also sheltered a snake in its crown. The woman became unconscious, her numb hands tightly wrapped around the trunk of the tree, unmoving, not provoking the snake." The rescue workers took her for dead, but she was alive. Then he remembers that the father who sacrificed his life so that his daughter could survive.

Heart-wrenching stories loosen the purse strings of philanthropists and charities. But disaster reportage is not merely human interest stories: they can facilitate action. "The government response could have been better," says Prasad. In fact, in later years, newspapers catalysed the government's efforts towards better cyclone response, with extensive local coverage. Says K Srinivasa Rao, Chief Reporter (Political), *Eenadu*, Hyderabad: "The concept of local and rural reporting developed."

Through 1978-89, *Eenadu* devoted a page each day to the districts in the reach of its edition. In 1989, it introduced a daily district tabloid with the main paper, a revolution of sorts among regional papers. This Hyderabad-based tabloid has 16 pages, compared to its competitors, which have 8-12 pages. That means that each of the 1,100-odd mandals in the

state get detailed coverage. "A contributor or correspondent for each mandal of 15 to 20 villages is now getting an extraordinary flow of information," says Prasad. Today, with a readership of about 8.5 million, the regional press in the state is one of the most vibrant in the country. The result is, says Prasad, "extraordinary response" in disaster situations. The day after the November 1996 cyclone, Chief Minister Chandrababu Naidu visited the affected villages by helicopter. "He was the first to come," recalls a villager at Balusuthippa, the worst hit of the villages.

Airdropping to a disaster spot, it turns out, is good leadership and good disaster management – apart from being an electorally advantageous act. The District Collectors followed suit in motorboats. The villagers recall that the next to plummet from the air were food packets. Immediate action by the state CEO – as the microchip savvy Chief Minister is known – has also given a few public relations brownie points to him, journalists note. Wide news coverage also means, obviously, more and faster relief money.

So beneficial has information dissemination been that, in contrast to its earlier tactic of underplaying disasters, the government now tends to overplay them. The line of action: the state first declares, say, that the loss is Rs 100 cores; the figure then becomes Rs 200 crores, and then escalates to thousands of crores. How does the media deal with it? "We respect the state interest," says a journalist.

Rao says wide media coverage can be educative as well. "After the advent of satellite TV, there have been many changes in the way disasters are reported. Many channels even try to make people more aware." Prasad notes that media articles explain the science and safety aspects of a cyclone, that, for instance, how the lull at the eye of a cyclone can be a breather before a doubly ferocious strike. "If after a strong wind you experience a lull, you can expect another gale in the reverse direction in 30 minutes or so." Prasad notes that a lot of awareness has been created in the deltaic regions of East Godavari, where fishermen carry radios. FAO now supplies radios to fisherfolk so that they can listen to weather bulletins.

But media coverage cuts both ways. A careless statement, or even an inadvertent oversight, rarely escapes reportorial or photographic notice. Says Rao, "In 1996, while the government claimed successful relief work, bodies were lying around. We published a disturbing photograph of a dog touching a corpse." The government machinery was shaken to the core.

There is, of course, scope for improving disaster reportage. "Often, untrained reporters and contributors tend to overreact. That becomes the major weakness of reporting," says Rao. "Most of them are not trained specifically to cover disasters." The areas of reportorial focus also require fresh attention. "The stress of post-disaster coverage is on ensuring that the relief has reached all the affected people." It also ensures accountability. Beyond these mechanics of reportage, what are needed are stories of people rebuilding their lives, people as participants in their own progress, not just victims and recipients of aid.



9

Rescue, Relief and Rehabilitation

BLURRING MARGINS

It is said that with conscious irony that the three 'R's – rescue, relief and rehabilitation – do not begin with disasters but often end in them. Can we defeat this depressing truism?

Rescue : Save or set free from danger or harm

Relief : Alleviation or deliverance from pain, distress and anxiety

Rehabilitation : Restore to effectiveness or normal life by training, etc

The Pocket Oxford Dictionary of Current English

Impact of cyclones

The damage that cyclones cause does not fade as time goes by from the short-term to the long-term – all that happens is that the problems metamorphose, the colour of danger changes. The response remains urgent on a massive scale weeks, even months, after the event is over.

The major impact of cyclones is broadly categorised below:

- Loss of lives, injuries and other health consequences such as epidemics and Post-Traumatic Stress Disorder (PTSD)
- Loss of habitat
- Loss of cattle, damage to crops and agriculture fields
- Damage to public utilities
- Disturbance and damage to the ecosystem

**Storm surges
often kill seven
times more
people than
severe but storm
surge-free
cyclones**

Loss of lives...

Most lives are lost during a cyclone on account of floods and the devastating storm surges that often accompany cyclones. In severe cyclonic storms with storm surges, more than 90 per cent of the fatalities occur from drowning, either during the incoming water phase or during the (usually more devastating) out-surges. In severe cyclonic storms without storm surges, the deaths are more or less evenly divided between drowning and the collapse of buildings.

Storm surges, or mini-*tsunamis*, are essentially huge amounts of water sucked up by the low pressure at the eye and then propelled forwards and outwards by the driving winds on the outwalls. Storm surge height (up to seven metres) and length (up to 50 km) depends on the tides, the rate of water runoff from the land, onshore winds, and the coastal configuration. They cause the most havoc when they are receding. On an average, storm surges kill seven times more people and damage three times more crops than severe but storm surge-free cyclones (Winchester, Peter, 1992).

For instance in the November 1977 cyclone that hit the Krishna-Guntur-Prakasam-West and East Godavari districts in Andhra Pradesh, storm surges rose to as much as 9-20 ft, were 80 km long and 24 km deep, and shot up the death toll to over 8,000, one of the highest figures ever recorded.

Injury, health impact

One important aspect that requires attention in the aftermath of cyclones is the injuries and other health impacts on the affected populace. The most common debilitations are waterborne diseases such as diarrhoea, dysentery, typhoid, viral hepatitis; respiratory diseases such as pneumonia and whooping cough, and other diseases such as chicken pox, measles, gastroenteritis, cholera, conjunctivitis and fever. Of late, experts have pointed out that the affected people may suffer from long-term Post-Traumatic Stress Disorder (PTSD), characterised by a high incidence of divorce, alcoholism and suicide.¹

¹ Sharma, VK and Singh, R, *Psychosocial Consequences of Disasters: Case Study of the 1996 AP Cyclone*, paper presented at the National Workshop on Psychosocial Consequences of Disasters, NIMHANS, Bangalore, 1997

Loss of habitat

Despite being the one state in the country that has suffered, continues to suffer, and presumably will suffer the maximum number of cyclones, in the matter of safe shelter during cyclones, AP is well behind the national average. More people in the state live in *kutcha* houses vulnerable to collapse during floods and cyclones than in any other.

Despite having historically suffered the maximum number of cyclones in the country, Andhra Pradesh has more people living in kutcha houses than any other Indian state

This dismaying fact was more pronounced in the 1970s. A National Sample Survey (NSS) done between October 1971 and September 1972 found that out of the 34,319 houses taken up for construction in the state, as many as 16,249 were *kutcha* buildings, each costing on an average of a pathetic Rs 329. In the Eighth Plan, the Andhra Pradesh Housing Board was actually allotted only Rs 229.1 million out of the actual provision of Rs 318.5 million – and of that amount, it went ahead and spent no more than Rs 194.6 million.

There is a case for the argument that better-designed *pucca* houses are an essential component of cyclone disaster mitigation. But the path to disaster obviation is strewn with social ironies. After the devastating 1977 cyclone, major cyclone-proof housing activities were undertaken with some sincerity. But instead of turning into a great leveller, *pucca* houses became a status symbol, even in pockets of poverty. In any case, it was also realised that as a disaster mitigation effort, housing can play only a limited role. Other factors such as storm and flood patterns, location of the house, and the occupant's options to relocate at times of emergency also define the "disaster vulnerability" of a household.

In the November 1996 cyclone, struck by a storm surge 9-20 feet high that penetrated 15 miles inland, many victims were trapped inside their "safe" homes. Some who moved to the terraces of their houses were safe only for a short while. The sheer force of the water lifted the thatched huts and floated, spun and upended with the tide. Roofs broke apart and families were scattered – some consigned to treetops, a great many drowned and "missing". Some of the "cement-and-concrete" *pucca* houses also crumbled, the walls shattering, and collapsing. Those who had taken shelter in *pucca* buildings like schools drowned when the water entered the buildings and trapped them inside.

Socioeconomic factors obviously play a major role in defining the vulnerability of the people to a cyclone. The most vulnerable households share a few characteristics:

- The most vulnerable households are often located in low-lying, flood-prone land, usually village peripheries
- Most of the poor and vulnerable households have/had the least remunerative employment and the least assets

They are economically marginalised; they have the least employment opportunities; and they have the least resources to sell, including their own labour. Their health status is poor.

Only an understanding of the entire impact range – climatic and otherwise – that people are likely to be exposed to can help evolve holistic risk-reduction strategies (Winchester, 1992).

Other losses

Other major disaster tolls include loss of cattle, crops, and damage to agriculture fields and public utilities such as railway lines, roads, transport, power lines, communication systems and public buildings. In further aggravation, bad design of roads and railway lines, that does not take into account the natural drainage pattern of the land, exacerbates the flood situation by blocking receding floodwaters. The capturing and conversion of wetlands for construction and agriculture also amplifies the vulnerability and delicate balance of the land, as mangrove forests in the wetland act as barriers against cyclonic storms.

The response to a cyclone is through a confused ad-hoc mechanism that creates a communications chaos between satellite imagery and remote sensing at one end and the dissemination machinery at the other

Response: ad hoc mechanisms

The various phases of a disaster response mechanism comprise of early warning, evacuation, rescue, relief, rehabilitation and development. In the absence of a comprehensive policy to deal with disasters and development, the response to cyclones has been that of the grinding of an ad hoc mechanism.

Early warning: With the advent of satellite imageries and remote sensing, cyclone forecasting has become more sophisticated and

accurate.² However, the dissemination of any warning whatsoever percolates down to the essential block level rather late.

The problem lies in the inadequacy of communication networks at the local offices. Even if the communication were to reach the block offices in time, the absence of vehicles makes it difficult for officials to propagate this information and organise evacuation in the case of an emergency. Especially when the vulnerable villages are located in far-flung, inaccessible villages or on islets or deltas, the dissemination of timely information becomes crucial – and is clearly inadequate.

Evacuation: Forecasting plays a crucial role in facilitating evacuation. Just before the 1983 cyclone hit the AP coast, 50,000 people were successfully evacuated because of early warning and, yes, political will. Regarded as a costly and difficult method of saving lives, evacuation often becomes inevitable.

Documentation proves that socioeconomic and psychological factors prevailing at the point of impact tend to hamper evacuation. People refuse to leave their homes and fields even when a cyclone is about to hit. Officials are often reluctant to take the initiative to evacuate fearing the consequences that go with that costly chimera, the false alarm. Sometimes, the prodigious haste that accompanies evacuation also raises human rights issues, as people may have to be induced or even forced to evacuate in the face of a clear danger (Winchester, Peter, 1992).

Rescue and relief: This is the “sandwich” phase which usually lasts for two to four weeks. It is marked by a strong presence of the armed forces, various government agencies, NGOs, and other voluntary groups. The situation is decidedly volatile, with many actors with varied interests “paradropping” into the disaster site. “Band-Aid” relief, which does not take into account the long-term and actual needs of the affected population, is a common phenomenon, and an increasingly common complaint. Often, the commendable philanthropic outpouring that follows in the wake of disasters is out of tune with the ground reality.

² Singh, Arun Kumar, *Remote Sensing and Disaster Forecasting: The Indian Experience*, paper in *India Disasters Report : Towards a Policy Initiative*, Oxford University Press (2000).

The heightened role of politicians made it difficult for officials to arrive at any kind of conclusions and enumerations

Politician-bureaucrat skirmishes intrude into the realm and process of relief. "The heightened role of politicians made it difficult for officials to arrive at any kind of conclusions and enumerations."³

Rehabilitation and development: Rehabilitation, the process through which the affected communities are returned to normalcy, is a long-term slog. Rehabilitation should ideally include restoring life sustenance systems as well as rebuilding the social fabric of the affected communities. A community-based rehabilitation should ideally comprise an integrated programme that takes into account the health, education and the special needs of women and children. It should address the needs of farmers, agriculture labourers, and artisans with special focus on marginalised and vulnerable groups.

In the case of AP, the state government as well as donor agencies have pumped in huge amounts of money to rehabilitate the cyclone-affected people. In the ongoing scheme of things the specified amount of money that would enable the affected people to purchase the tools of their trade or to undertake their own restoring activity is provided along with money for rebuilding their houses. Numerous factors, including political considerations, define the *ex-gratia* payments extended to the affected people. In the 1996 cyclone, the maximum *ex-gratia* payment given was Rs 100,000, which, by any accounts, is less and adequate.

The norms related to the amount of compensation to various categories of the affected were formalised by the Government of India in 1986. The same norms are being followed today with suitable modifications. To rehabilitate those affected by the 1996 AP cyclone, for instance, the government formulated a scheme to give 50 per cent matching grant to voluntary organisations that came forward to construct houses.

Changing modes of response

Relief is defined as an attempt undertaken by humanitarian or political activists to alleviate the pain and distress of the people

³ Reddy AVS and Sastry KR, *The Politics of Disaster: Public Pressure and State Response to Cyclone Relief in Andhra Pradesh in Disaster Management*, Vol 4 Number 3, 1992

affected, especially in a crisis situation. Oxfam views emergency relief as part of a range of humanitarian responses to poverty and suffering which support the people's capacity to take greater control over the forces that affect their lives.⁴ A crisis may be defined at a point at which radical change becomes necessary – when the status quo has become clearly unsustainable. Not all crises give rise to emergencies; and change is by no means always negative.

For people or societies that are already vulnerable, even a small shift in their situation may give rise to a crisis that outstrips their capacity to cope – in other words, a disaster or emergency. Crisis does not refer, therefore, only to an unexpected catastrophe, but also to the culmination of a slow build-up of political, economic or environmental factors. The combination of these factors with a sudden event, such as an earthquake or a major accident, can prove overwhelming.

Traditionally, sociologists and development and charity workers viewed emergencies as temporary interruptions in the process of development. Especially since poor people are virtually under constant crises and any emergency amplifies their vulnerability, the response to emergency should ideally be to lessen the underlying vulnerability, ensuring that humanitarian relief efforts systematically address the root causes of the crises.

Drawing up categorisations such as “natural” or “humanmade disaster” is of little help in predicting the impact of a crisis, or the longer-term implications of a disaster, or of relief efforts. The conventional division of programmes into categories of “relief”, “rehabilitation” and “development” is proving to be more and more unrealistic and unhelpful – particularly so because such divisions do not reflect ground-level realities.

It is those governments which integrate relief, rehabilitation and development, rather than dividing them into components of an imagined evolutionary process, that have been most successful in alleviating hunger, observe noted economist Jean Dreze and Nobel laureate Amartya Sen.

The traditional view, now dispensed with in most nations, of emergencies like disasters is that they are temporary interruptions in the far larger and inexorable process of development

⁴ *The Oxfam Handbook of Development and Relief*, an Oxfam publication, Oxford, 1995

Any dividing line between the relief, rehabilitation and reconstruction phases is necessarily imprecise, especially when an emergency has been protracted over months, years – or even decades. Rehabilitation and reconstruction are areas where relief and development become inseparable from each other. Specific rehabilitation methods should also reduce the vulnerability of the community to similar emergencies in future.

Relief work should be held to development standards. Rehabilitation process should also focus on social and economic interventions as well as on improvements in material conditions. Both relief and development should be more concerned with increasing local capacities and reducing vulnerabilities than with providing goods, services or technical assistance.

In fact, goods, services, etc, should be provided only insofar as they support sustainable development by increasing local capacities and reducing vulnerabilities. Development work should be concerned with long-term sustainability. Thus, every development programme and project should anticipate and be designed to prevent or mitigate disasters. They should identify and address the vulnerabilities of the people with whom they work, and ensure that these are reduced over time.

Though the urgency of human need compels swift action and thorough assessment and planning, it may be impeded by constraints of many kinds. However, it is precisely because social structures and cultural traditions and economic and political systems are weakened by emergencies that individuals are made more vulnerable to damage by ill-conceived interventions.

In the case of disasters in India, the state and civil society have responded swiftly and comprehensively with rescue and relief operation. But the government continues to view rescue and relief work as the responsibility of its revenue department. And public support is not factored into it. This is consistent with the overall perspective of the administration in viewing people as passive recipients of government largesse. As with welfare and development programmes, people have no participatory role in defining and implementing rescue and relief operations.

Providing legitimate space for people to play a meaningful role would significantly improve post-disaster recovery initiatives. Relief is no substitute to people-oriented action.

Rehabilitation is often hampered by two reasons. First, there is the inability to programme relief as a development opportunity, which is why such initiatives lack actions that would regain sustainable livelihoods. Second, the Indian public views the provision of relief as a collective responsibility but considers rehabilitation and development as the responsibilities of the government alone. Often enough, however, the government action falls far short of expectations and actual needs.

Worldwide, as governments shift focus away from social sector interventions, civil society faces a challenging task in addressing the issue of long-term rehabilitation and development. Civil society's role is no more limited to feeding, clothing, and housing the people affected by disaster, but has expanded to include the empowerment of the most vulnerable.



SENSITIVITY AND EMPOWERMENT

Gender inequalities directly affect the life chances of half the world's population

The matter of gender responsibility and women's empowerment is at the core of the problems facing disaster management in India today, as it is in all of South Asia, for if this is not taken into account, a disaster continues far after the relief and rehabilitation is ostensibly over

For all purposes, sexual identity is determined by nature, whereas gender identity is not: it is constructed by social systems and, therefore, can change, and can be changed. Gender refers to a set of different roles and characteristics which are considered appropriate to males and females, and which vary according to culture, ethnic identity, race class and age. Gender roles and relations are constantly changing at variable rates and in diverse ways in different cultures and social groups, and are influenced by global and local economic and cultural trends.

Gender inequalities directly affect the life chances of half the world's population. In South Asia, women's poverty – and its consequences – is greater and deepening in relation to men's. Women are particularly vulnerable because they have fewer resources in their own right and under their own command. Their place in decision-making systems is impermanent and precarious while the gender-biased oppression they suffer is, in comparison, constant and unrelenting.

South Asia is "fast emerging as the poorest, the most illiterate, the most malnourished, the least gender-sensitive - indeed the

most deprived region in the world.”¹ The Gender Empowerment Measure (an index of access to political, economic and social opportunities) for South Asia has the lowest value amongst all regions, including sub-Saharan Africa, despite female heads of government in Bangladesh, Sri Lanka and, until recently, Pakistan.²

Gender plays a role of almost entirely unappreciated magnitude in disaster management. Women, by virtue of their lower economic, social, and political status, tend to be more vulnerable to disasters, of all persuasion. For instance, women have reported that even when they have had access to cyclone (or community) shelters, their own protection and care has hardly been a cause for concern: they have had to work doubly harder to gather fuelwood for cooking. They also face tremendous hardships in taking care of their children, since that is seen as their sole responsibility, with little or no help due from men. The non-availability of items of personal hygiene, the virtual non-access to toilets and the consequent lack of privacy, apart from placing women in physical jeopardy, puts them in a very difficult position. Furthermore, the special health needs of women, especially pregnant women, in post-disaster situations are ignored.

Apart from all the inequities that women in India are subject to in the usual course of things, disasters bring to bear upon them a whole plethora of distinct problems: those of post-disaster personal hygiene, of gender-specific medicine and medical treatment, of control over receipt of relief money, of a say in the design of rebuilt residences, of livelihood in the consequence of widowhood, etc. Not many of these issues have been addressed even by NGOs and VOs involved in women's work, and certainly none by government departments and agencies.

The various economic activities undertaken by the government and by NGOs have not had any significant impact on women.

By virtue of their lower economic, social and political status and positioning, women tend to be among the most vulnerable to disasters and to be held responsible for the familial reconstruction thereafter

¹ Haq, Mahbubul, 1997, *Human Development in South Asia*, Oxford University Press

² Rehman, Tahmina, 1999, *Gender Issues in Emergency in South Asia in India Disasters Report, Towards a policy initiative* (ed) S Parasuraman and Unnikrishnan PV, Oxford University Press, New Delhi (2000)

80% of deaths in the 1991 cyclones were those of women and children

For example, the allotment of house sites for the construction of houses has invariably been in the names of husbands or sons. There are cases where even 20 years after the 1977 cyclone, a number of elderly women find themselves without a permanent shelter which they can call their own. Women from women-headed households routinely miss the employment opportunities provided and created during relief and rehabilitation phases because they were busy with "other matters" – usually singlehandedly ministering to their children and husbands and other survivors in their families. This adds to their later burden of finding work for themselves, a burden that, given the course of things following calamities, is almost inevitable.

It goes without saying that the poorer the women, the more they suffer in a disaster. In India, hundreds of thousands of poor people – men, women and children – are displaced annually by disasters such as cyclones, floods, droughts, land degradation and civil conflict. In India, it is an established fact that during floods and cyclones, women often drown when they are weighed down by their saris rendered unwieldy by water-soaking, or when their long hair is caught in flotsam or submerged debris. They are also the last to find place on boats or rafts or, indeed, on rooftops. In fact, 80 per cent of deaths in the 1991 cyclones were those of women and children.³ Often, displaced and with nowhere to go, younger women face destitution and are frequently forced into prostitution in towns and cities. Older women turn to – or are put to – begging and charity. Unhampered by physical responsibilities, men are known to take rapid advantage of cyclone warnings, while female householders who take the onus for essential cyclone preparedness activities are slow to evacuate to safe-sites.

The problem of gender accommodation extends upward from the family to the relief agencies, both government and non-government. An evaluation of the 1996 cyclone response in Andhra Pradesh squarely focussed on the gender-insensitivity of one of the relief agencies: the agency had delivered all provisions for food to the disaster-affected people – including the crucial dry ration and fuel. Still, no family could cook: women complained they had been given not a single cooking utensil. But they

³ Rehman, Tahmina, *Oxfam* (1996).

complained later, when it had ceased to make any difference. The all-male relief group had overlooked an aspect that either women members or a little sensitivity could have kept in light.

This makes the conclusion inevitable that interactions with the affected community and the service-provider become more productive – are, in fact, crucial – when there are women in a relief team. Women relief-workers have the facility of sensing the not-so-transparent – to men – trauma, immediate and long-term, suffered by women affected by disaster, and their especial needs.

In a recent study by Dr. V K Sharma and team from the National Centre for Disaster Management, New Delhi on the long-term psychosocial consequences of people affected by the 1996 AP cyclone, the authors have noted that gender equations of the relief team directly influenced the affected women's interests. As the rates of divorce – largely initiated by men – increased after the cyclone, many women began consuming alcohol. Suicide rates increased, especially among women. The authors note that had there been more women relief workers, this disturbing trend could have been exposed, if not reversed, in time.

It is also important to mark out areas of disaster management that are best handled by women, and to make an effort to so delegate responsibilities. Food distribution systems, for example, are most effectively managed by women; so is post-disaster house layout and design.

It is thus essential that, in a post-disaster scenario, it is vital to ensure that:

- Particular attention is paid to women's views in the assessment stage
- Women's actual responsibility in both domestic (in terms of household subsistence, health, childcare) as well as production and economic activity beyond the subsistence level, are taken into account in determining the consultation process
- Women representatives are included at all levels of planning, decision-making, implementation and evaluation

It is essential that women form a substantial portion of a relief body, because interactions with the affected community and the service-provider become more productive with their presence

- The particular constraints faced by households maintained by women are taken explicitly into account in designing and implementing relief programmes
- Special attention is provided to unaccompanied women, lone parents and widows
- The issues of legal, sexual and physical protection are properly identified and addressed

Gender awareness helps to not only identify the different needs of women and men during and after disasters, but also their capacity and responses to change. This is more in light of the fact that women themselves tend to underestimate the enormous variety and magnitude of burdens they bear; they may have negative images about themselves, and be unused to seeing themselves as strong and effective survivors, managing a wide range of household and social responsibilities. For intervention planners, it thus becomes extremely important to employ a deliberate and sustained effort to ensure women's participation so that they benefit equally with men.



11

Health

BRINGING LIFE TO THE LIVING

Healthcare must take priority over everything else in the aftermath of a cyclone – and few agencies, government and non-governmental, are prepared for this eventuality in its entirety

The most immediate repercussions of a disaster are on health and in the myriad horrendous ways in which it can be affected. In terms of relief priority, healthcare has to take precedence over just about everything else – and this is where few agencies are prepared in their entirety.

In its broadest sense, of course, every aspect of disaster management is related to health – from food to medication to accommodation. But what this chapter is laying emphasis upon is on health's most reductive meaning – that which has to do with the human anatomy, physiology and the mind.

In the immediate aftermath of a disaster, the fresh wounds and shock, when unattended or inadequately ministered to, as they so often are, lead to partial or complete disability and almost certainly to some degree of psychological trauma. While physical trauma may be specific to different kinds of disasters – impact wounds at earthquakes and invasive wounds during civil unrest are distinctive from wounds during floods and cyclones, for example – psychosocial trauma is shared right across the band. And the individual psychological seisms inevitable in a disaster scenario invariably lead to more enduring, broadbased and even collective psychosocial trauma.

In the aftermath of a disaster, the wounds and shock, when left entirely or even partly unattended often lead to partial or complete disability and almost invariably to psychosomatic trauma

It goes without saying that physical wounds and care must be part of immediate disaster management responses. Immediately thereafter, if the food, nutrition, water and sanitation issues are not addressed, the oversight will increase the vulnerability of the affected community and may lead to malnutrition, epidemics and even starvation. It is a well-established fact, for instance, that diarrhoea is a major cause of mortality and morbidity in emergencies, and some studies have shown that it contributes to between 25 to 50 per cent of all post-disaster deaths.¹

In the Indian context, disasters often give rise to vector-borne diseases. Waterborne outbreaks are common after floods and cyclones, and the ensuing waterlogging often culminates in epidemics. As the years go by, newer areas, some entirely unprepared, are being opened out to the vagaries of vectoral impact. The unexpected 1996 flashfloods in the western desert state of Rajasthan killed about hundred people – and that was just the beginning. A few months later, more than 1,000 lives were lost to a vector-borne malarial outbreak that rampaged through the area, whose population had never been tested with – and thus even nominally immunised to – a waterborne disease in recorded history. These are no longer isolated instances in India, but are becoming more common by the year.

But the single aspect of healthcare that routinely escapes the attention of health planners and workers in disaster scenarios is the psychosocial debilitations of disasters, particularly the psychological trauma that women undergo. Post-disaster neuroses, nightmares, even catatonia, are long-term psychosocial consequences that deserve far greater analyses and treatment than they have been receiving. Recent joint research by the National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, and the National Centre for Disaster Management, New Delhi, and Oxfam has shown that there was an increase in alcoholism, divorce and suicides after some of the major disasters of the 1990s.

While a holistic and comprehensive understanding of all the health consequences of all kinds of disasters might yet be a long

¹ Ferron, Suzanne, 1998, *Oxfam Guidelines for Hygiene Promotion in Emergencies*, Oxfam, Oxford

way off in India, it should at least be understood that their consequences on the general health of the population are manifold. Preparations to deal with them must thus also be multi-pronged. This is very critical in the Indian scene, where the public health system is, to put it mildly, weak.

The 1990s, in fact, have seen the melting of the public healthcare system in India into a puddle of lukewarm policies and good wishes. At the same, the resurgence of epidemics of diseases such as malaria and tuberculosis continued through the decade, paralysing the system. Diseases that had seemingly been given a burial – like the bubonic plague – reappeared, stunning doctors who were unable even to recognise the symptoms. The public health system, on its part, was unprepared with vaccines, and was unable to cope with infected human exoduses to previously unaffected areas.

Both cause and symptom of the malaise is that the government's emergency medical relief planners do not find themselves in an active position in disaster management planning. In the wake of the 1993 Marathwada earthquake in the western state of Maharashtra, the Bombay High Court castigated the Maharashtra state health department for failing to provide even primary healthcare, water and sanitation to the affected people. Even professional bodies such as the Indian Medical Association (IMA) have yet to identify disasters as an area of intervention, leave aside an area of intervention that deserves prioritisation mention and training.

In the absence of organised disaster medical management, medical colleges in the vicinity of a disaster often rush their doctors and students to provide emergency medical relief. As a philanthropic gesture, this is exemplary, but it is not the same as a planned disaster mitigation effort. Despite the frequency and magnitude of disasters in India, disaster medicine has yet to emerge as a discipline of specialisation, and medical assistance during disasters has not become a mandate of medical colleges. Much the same is the case with institutes that teach and train paramedics and healthworkers.

This yawning lack of attention to disaster management ascends to the policy level: the certitude of planning rests on (both macro

and micro) information on and documentation of disasters – which is almost entirely absent. The Indian healthcare system (read the Indian government) has yet to develop parameters to document the health concerns in a disaster scenario.

In such a situation, we would like to suggest the following method of classification, particularly with reference to cyclones, which is in tune with international standards:

Food and nutrition

Observers note that at the scene of a cyclone, food is usually in abundance in the first few days following the disaster. Supplies from charities and philanthropists in India and abroad often flood to select pockets – places, by providence, located nearer to the road or highlighted by the media. While these pockets get pampered, remoter villages suffer undeserved and unwarranted want. Furthermore, this propitious supply is not necessarily based on a proper assessment of the food and nutritional needs of the people – there have been cases of aphrodisiacs landing up where they were least needed. There has not been a serious, systematic effort to streamline the very human gesture of charity.

The alternative would be to inform the suppliers and donors of what the population needs and to ensure that food reaches the truly needy. For this, local NGOs and community-based organisations will have to play a more proactive role.

It has been noted that providing adequate nutrition, especially to the most vulnerable sections such as children and women, can avoid situations that may warrant the more difficult propositions of supplementary and therapeutic feeding.

A quick review of food relief in the wake of the 1996 AP cyclone shows that mostly prepared food and dry ration was provided. The relief package included, on an average per person, 4 *chappatis*. This fell short of the minimum calorific standards stipulated by international relief specialist agencies of 2,400 kilocalories per day per adult. Unfamiliar and inappropriate food, as much as lack of food, may lead to malnutrition and lowered defences. The special nutritional needs of pregnant women, lactating mothers and children are usually ignored in post-cyclone food distribution interventions.

The exigencies of food and nutrition demand not only unspoilt edibles but constant interaction between the affected population and the suppliers, and this is where the relief agencies must come in proactively

Water and sanitation

Ignoring public and environmental health has been perhaps the greatest mistake where cyclones are concerned. It has been found that improvements in water quality alone can produce a (limited but substantial) reduction in childhood diarrhoea by 15 per cent. The greatest reduction was attributable to safer excreta disposal (36 percent) and handwashing, food protection and improvements in domestic hygiene (33 per cent).²

In fact, pressure on water resources and inadequate sanitation and waste disposal provide ideal conditions for the spread of water-related diseases such as diarrhoea, dysentery, typhoid and scabies. The only way to obviate the problem is to ensure water supply in sufficient quality and quantity.

In cyclone-affected areas, water supply and sanitation is a challenge. Sanitation techniques include:

- Water purification by chlorine tablets
- Wells managed by PHE Department
- Disposal of excreta
- Disposal of dead bodies

Preventive and curative care

There is only one prescription applicable here: emergency medical intervention must take a broad-based and long-term perspective within the principles of primary healthcare.

Psychosocial consequences

Disasters impact directly, and with awesome permanence, on the emotions of the affected, and prompt psychological reactions in more cases than usually come to light. The World Health Organisation (WHO) reviewed the magnitude and dimensions of psychosocial consequences and possible interventions to manage them through a publication, *Psychosocial consequences of disasters-Prevention and Management*. Psychosocial coping depends on the ability of the victims to adjust psychologically,

² Esrey et al, 1985, 1991, quoted in Ferron, Suzanne, 1998

***A psychosocial
component must
be integrated
into a
comprehensive
disaster
response plan***

the capacity of community structures to adapt to crises, and the help available.³

Post-cyclone psychosocial consequences include anxiety, neuroses, sleeplessness and lethargy at the individual level. At the community level, it gets manifested in the form of school dropouts among children and high rates of alcoholism, divorce and suicide among adults.

Primary healthcare workers are the point of convergence for interventions. The sensitive handling of psychosocial trauma must be included in the training programmes of all healthworkers at disaster situations. Training programmes must also encompass first aid medics, community nurses, socialworkers, teachers, and administrators.

The training curriculum must include psychological and psychophysiological concepts about the reactions of the affected, recognition skills of traumatic signals and symptoms, and simple and immediate methods of dealing with psychosocial problems (including counselling, psychotherapeutic methods, pharmacotherapy, etc).

A psychosocial component must be integrated into a comprehensive disaster plan.



³ Murthy, R Srinivasa, *Psychosocial Consequences of Disasters: The Need for Mental Preparation in India Disasters Report*, (Ed) Parasuraman, S, Unnikrishnan, PV, Oxford University Press, New Delhi (2000).

12

People's Perceptions and Other Observations

TIME AND AGAIN

The single most important factor in this cyclone (1996) – and every other – was time: time for warning, time to evacuate, time for shelter. And it just wasn't available

The people in Gollepadu, Pedagogotu, Velangi, Chuluru and other areas have decided not to celebrate Diwali to mourn the deaths of their near and dear ones and the devastation caused by nature's insensate fury. "In fact, we wanted to celebrate Diwali this year with a big bang, but the unprecedented tragedy caused to us due to the cyclone has forced us not to celebrate," said K Ramana Rao, an agricultural labourer from Ravulapalem. Vinta Virabhadra Rao of Agraharam village, whose house had collapsed, said that nothing could have made them imagine that the cyclone could cause such havoc and that the intensity was unanticipated. "We didn't take this seriously," he said. The officials themselves had not thought that the cyclone could cause such damage. The Mandal Revenue Officer (MRO) of Mandapeta, Prabhakar Choudhury, said that three deaths had been confirmed in the mandal. More than 5,000 ha of paddy and coconut trees were sandcasted in 14 villages in his mandal. Others in the same village said that it would take two to three years for the coconut crop to regain its normal production level.

N Rama Narayana, a 16-year-old boy, was trying to put his baby brother to sleep when the house gave way without warning and the roof collapsed, killing both. The parents of Inja Mahalaxmi, 12, of Machavaram village, were mute witnesses to her death,

more or less under similar circumstances. R Venkat Rao of Indrapalli village had hidden himself under a tractor but had died of a tangential impact, a heart attack. Many such instances were uncovered as more and more areas were accessed by rescue teams.

In Mummidivaram, Morta Raju, a popular physician of Thanelanka village and his son drowned while trying to save an infant from a submerged house. The infant, however, was rescued later. Earlier in the day, Morta Raju had rendered yeoman service by alerting the villagers about the impending onset of the cyclone.

There are several cases where people could not locate their kith and kin and had to comb hospitals and railway and bus stations. Such heart-rending scenes were a common spectacle throughout the prosperous Konaseema region. Mummidivaram, along with I Polavaram and Katrenikona, were the worst affected. People in Mummidivaram mandal, the granary of the Konaseema area, were the cyclone's particular victims. K Vijaya Kumar of Thanelanka said he preferred to have had perished as his entire coconut crop was destroyed and it might take as long as 10 years to regain productivity. Some gastroenteritis cases had been reported in the village. Officials claim to have chlorinated 1,800 wells but the people disagree with the figures and dread the thought of drinking the water. All the water sources were filled with saline water and chlorinated drinking water was provided only a week later.

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In Bhairavapalem, Lanka Parvathi and her entire family of 10 survived the cyclone, although initially it was thought that she had died. Other villagers say that the howling winds sounded like jet aircraft taking off. Veeranna of Bhairavapalem said that those who ran helter-skelter fell prey while those who had taken shelter in RCC buildings were saved. A 70-year-old fisherman from Balustippa said that he had never seen a cyclone of this intensity, not even the legendary one in 1969. The Coast Guard reported that over 100 bodies were fished out from Bhairavapalem alone.

Many people complained that their losses were not properly recorded and the deaths properly enumerated, and that even

when houses were found fully collapsed, they were recorded as partially damaged. A salt farmer said that they had not even been considered for compensation. There were, however, complaints that some antisocial elements were reporting more deaths in order to corner the *ex-gratia* of Rs 100,000 per fatality. Touts have also become active arranging the disbursement via some officials.

Visits of VIPs hampered relief operations

The situation at Etimoga, another village in the same estuarine belt, is much the same. Many of the village's fishermen swam towards the shore in winds of gale force until they were rescued by the *Malavika*, a vessel in the service of the Oil and Natural Gas Commission, and then flown to Rajahmundry by naval helicopter. Some fishermen simply hung on to pieces of wreckage and reached the shore.

Relief of any sort came late to the villages, well after the dispersion of the cyclone – and when it did come, it was woefully short of the expectations of the villagers. People seethed with anger when the MRO insisted that they produce ration cards. The general impression was that relief was being rushed to the villages without any pre-planning, so that while some villages had plenty, some had none. The visits of many VIPs also hampered the relief operations as the personnel otherwise engaged in them were being diverted to aid in the VIP's itineraries.

Relief supply

The expectations of the victims is running high and officials are clearly grappling with the situation. With their world collapsed around them, the victims can at best, on their own, pick up the bits and pieces of their thatched huts, weave canopies for shelters and then sit on their haunches by the roadside for approaching vehicles.

With the vastly inadequate food supply, people have taken to living on just about anything edible, such as twigs and leaves. Ration cards continue to be the prerequisite for doling out rice and kerosene and although officials claim that the norm has been relaxed, people at the smallest of settlements say that non-card holders continue to be discriminated against. The affected have not taken kindly to the fact that only Rs 5,000 of the Rs 100,000 is being given as cash and the balance as savings. The affected

fishermen's families want the whole amount immediately so that they can replace their boats.

In the case of the only fuel available, kerosene, the officials say that it has been dispatched to the affected villages. But villagers say that they have received no supply and that it is being sold for more than Rs 15 a litre. Pillipullayamma of Sitaramapuram in Uppalguptam mandal said that she was keeping the light alive in her house by giving one coconut a day to the shopkeeper who supplied fuel for the lamp. Officials have also recorded damages to the houses but no cash compensation had been disbursed till Wednesday to the people of Uppalguptam mandal. The Konaseema area's people are still groping in the dark as the electricity network has collapsed, and restoration to the normal level is likely to take a few months. Meanwhile, the price of vegetables in Amalapuram has shot up many fold.

Summary

An estimated 5 million people in East and West Godavari were affected in varying degrees, some by wind, some by post-cyclone flooding, some by the collapsing of roofs, trees, electric poles, and embankment breaches. But more pressing than the fatalities is the fact that a vast number have lost their livelihoods due to flooding, the uprooting of coconut trees, sandcasting and the salinisation of land. It is feared that from November 1996 onwards, five to six years would be needed for the recovery of the economy. While the big farmers can recoup their losses with little difficulty, the small and marginal farmers face a hard time ahead.

The responses of people to the field interview highlighted the following facts:

1. The cyclone warnings were received and were ignored by the fishermen community, leading to the deaths of the majority of them.
2. The dissemination of cyclone information by government officials was hampered by lack of time.
3. Relief supplies were concentrated in villages along the roads and the far-flung villages across the waterbodies got little or no relief material.

4. People cannot estimate the severity of the damage that a cyclone can cause, and there is a need to organise awareness programmes for all the coastal districts on a large scale.
5. In the above programme, individual cases of bravery in rendering help to fellow beings must be highlighted.
6. People had experienced problems in locating the dead bodies of their relatives. Information centres should be established for this purpose where all cyclone-related news can be made available not only regarding mortalities but also about injury cases admitted to hospitals. These centres must be included in the mandal plans. Rescue and relief teams must be instructed to send the information to these centres over the wireless.
7. People with limited landholdings suffer nearly 100 per cent loss but the compensation remains the same for everyone regardless. The government should consider a review.
8. Potable water reached late to some villages, and this will continue to be the case for villages located off the roads. In such cases, it is worthwhile constructing RCC core units where water and food can be stored once the warning commence, and which can be retrieved when the all-clear is sounded.
9. Salt farmers and shrimp and prawn seed collectors should be considered for relief compensation.
10. Rice distribution is done on the basis of ration cards, which is a patent paradox, considering that everything that people own is washed away. This leads to a lot of avoidable dissatisfaction.
11. People felt that relief was rushed to certain villages and some villages had no relief teams or vehicles visiting them. Plans should include the coordination of relief on a uniform pattern.
12. The electricity supply system always suffers extensive damage to poles and transformers. The energy department must plan to strengthen all structures to reduce losses during cyclones.

The bulk of relief is in the form of food, medicines and clothing, and very few people received materials for shelter and reconstruction

Responses to questionnaire

This was mainly applied to the East Godavari district. The bulk of relief is in the form of food, medicines and clothing. Very few people received materials for shelter and reconstruction.

The responses are to different aspects of disaster-related activities from previous experience to the needs of training. The highlights indicate that:

- Understanding the alert and warning messages by the people still requires greater comprehension of their content and import. The training could be organised within the district by the MROs.
- There is a need to ensure that warning messages reach everyone in every village and in the surrounding workplaces. Village volunteer teams should be formed and areas identified so that there is no confusion in delivering the messages.
- Community radio sets should be provided, particularly in the less accessible villages. They should be in the custody of a responsible person in each village administration and must be fully functional at all times. A person must be deputed to pay attention to the radio news at regular intervals once the cyclone is reported at a distance of 250 km from the coast, even if it is not heading towards the district.
- People must be encouraged to pay heed to the instructions issued in the broadcasts.
- People must be encouraged to secure their belongings and segregate the most important items, including food to last at least 24 hours. Water for the same period must be carried in all cases, preferably in small containers so that if some individuals do get separated from their families, they and the others have their own stocks. Training and practice are required to fine-tune this.
- The administration should plan the transport arrangements and everyone concerned should be in the know of all details and the priority for evacuation within the village. An orderly collection of people, ward-wise and area-wise, and calm movement to the vehicular parking area will ensure that there is no unnecessary panic.

- Rescue work should be organised with the help of village volunteers suitably trained and equipped.
- The government's relief capability and capacity must be made transparent. It appears that people have higher expectations of the government's logistics than it can actually provide.
- Responses to the participation of the people, their capacity and capability to handle the post-cyclone situation and the nature of training available indicate that suitable programmes must be planned at the district and the mandal levels.

SUMMARY OF OBSERVATIONS

Evacuation

The contingency planning put into effect by the state government did not fructify because the district administration was late in implementing the evacuation following the delay in the warning messages from the Cyclone Warning Centre, Visakhapatnam. Furthermore, the primary loss of lives was due to the unwillingness of certain sections of the vulnerable to comply with evacuation measures even after they had received the warnings.

Lead time

Many district officials also complained that the time between the receipt of messages and the implementation of the cyclone contingency plan was very short. There is a need for the CWC to determine if the time lag between the observation of the time and position of the cyclone and the issuing of the warning bulletin can be reduced. The revenue officials, in fact, arrived late because they had not received their orders on time. In some villages, the warning messages did not arrive through the revenue channel but through the broadcast from All India Radio.

Warning bulletins

The current version of the bulletins is exhaustive, giving all the information. But it does not lend itself to a quick grasp of its essentials. The CWC must be told to simplify the messages. The reduction of the text will also help in quicker transmission and understanding of the bulletins. The file data in the collectorates of Kakinada and other offices in Rajahmundry, Amalapuram, Eluru,

etc, were studied to ascertain the time taken for the warning bulletins to be transmitted and/or received.

Communications hardware

It should be ensured that the person in custody of the radio set be responsible for mobilising a team of volunteers to spread the messages and updates to every corner of the village. The Posts and Telegraph and District Communications Officer should verify that all village telephones are in working order in the cyclone months.

The Indian Meteorological Department should be instructed to keep the Distant Warning System fully functional before the cyclone period. The concerned MROs should report the defective DWS station to the Collector with the fault notice and the date of despatch of the test check card to Chennai, and the Collectorate must be made responsible for expediting the follow-up. March and October could be marked out as inspection periods, and the state government could perform a regular drill by sending a letter to the IMD at New Delhi and/or the CWC at Chennai requesting them to report by April 1 and September 1 each year that all the DWS stations are operative. It has been experienced that the recurring defect is in the battery operated power supply to the system.

Similarly, the battery backup of the wireless VHF sets must be functional. Since ensuring a full charge all the time can be problematic, the MRO must be authorised to hire batteries after an alert. Hand-held megaphones suffer the same problems, so battery replacements must be the responsibility of the village *sarpanch*.

Maps at the Control Rooms

The Control Room staff at different levels have not been able to interpret the full import of the bulletins since the messages are not related to the maps showing the coastline and the Bay of Bengal. By simply plotting the coordinates of the position of the cyclone as given by the CWC in each message, it would be possible for the Control Room staff to make reasonable guesses about the likely location of the cyclone even three hours after the first bulletin. An awareness of the characteristics of tropical cyclones will help in arriving at a good working estimate of the advance actions, obviously based on the translation speeds

calculated from the position recorded and transmitted from the CWC.

The district headquarters and mandal Revenue Officers did not have such maps, which is why no assessment of the future position of the cyclone was possible. Had this been done, a certain lead time would have been available, particularly at the mandal level Control Room, and the MRO concerned could have contacted the district Control Room for evacuation orders.

Sufficient lead time also ensures the district Control Room to publicise the names of the villages and towns in the district in relation to the position of the cyclone at any given moment.

The district headquarters and Mandal Revenue Officers did not have coastline maps that coordinated with the warning messages, and thus could not assess the cyclone's future position

Dissemination

One of the weakest links in the action plan for cyclones is the dissemination of warnings and evacuation to the far-flung villages. Even the MROs don't have radio sets, leave alone the *sarpanch* of the villages.

Messages to villages across waterbodies – island villages or those on sandbars – should be carried out through audiovisual inserts at regular intervals. Ongoing radio programmes should be interrupted and the frequency of broadcasts shortened to once every 15 minutes when the cyclone is near the coast. Apart from community radio sets, hand operated megaphones must be given to village volunteer groups. Local community food and water stocks must be arranged in sealed borewells and core cement structures for post-cyclone retrieval.

Wind damage

Wind damage was not confined to the coastal areas alone but extended well into the interior. Many structures in Vijayawada, 100 km from the coast, have been damaged.

Roofs are lost irrespective of the material used – GI sheets, Mangalore tiles, local tiles or thatched roofs. Roofs are blown off due to the absence of binding between them and the exterior walls, and the weakening of one inevitably leads to the weakening of the other even at low wind intensities. The failure of masonry walls also seems to depend on the type of foundation soil: in Guntur, houses that collapsed stood on black cotton soil.

Rain damage

The size of raindrops increases with the intensity of rainfall, tending to strike the ground with proportionately greater energy. This leads to a lot of soil erosion. A heavy volume of water in a short span of time causes inundation and softening of the earth from soaking. Walls are weakened, foundations of buildings crumble, and tank embankments collapse.

Conclusion

Particularly severe damage occurred to thatched houses and to the roofs of brick and tile houses. From secondary data and from discussions with MROs/MDOs, it was found that more than 90 per cent of the affected housing stock consisted of the former and the rest 10 per cent of the latter. Many cyclone shelters constructed under an international development assistance programme starting 1978 were found in poor condition, with their having fallen into disrepair due to lack of funds in the PR Engineering Department.

Similarly, the Andhra Pradesh State Electricity Board suffered extensive damage from the collapse of electric transformer poles. The telecom department found itself hampered by snapped and uprooted poles and lines. The microwave tower at Ravulapalem had collapsed. The worst hit was the agriculture sector: rice, the dominant crop of the region, is labour intensive and requires partially flooded marshy land. But when the storm inundated much of the flood plains in Konaseema, the loss of paddy led to a consequent loss of agricultural employment opportunities. The coconut and banana crops suffered a 50 per cent loss, with a time gap of 4-5 years for normalcy. Aquaculture tanks were breached, mangrove forests were almost totally destroyed. Much of this led to the eventual conversion of wetlands to settlements, increasing the vulnerability hazard.

Cooperation among agencies

Along with a complete transparency of information, other essentials are:

1. Emphasis must be laid on the need for intra- and inter-organisational integration, including NGOs

2. The relief staff and the public must be encouraged to anticipate the unforeseen rather than stick to rigid schedules.
3. The community must have a broad understanding of the government's limitations and its own parallel capabilities.

HIT AND MISS

ANATOMY OF A WARNING BULLETIN

Precious lives can be saved by two things: brevity of messages and warnings, and longer lead time. This time, both were absent

The message below was received at the Kakinada Collectorate at 1500 hrs. It had actually been delivered at 1331 hrs to the office of the Superintendent of Police, Kakinada, from where it was to be collected by/delivered to the Collectorate but was delayed by 1 hr 55 min.

Extract of CWC bulletin

TO : ADDRESSES AS PER CCPA (COLLECTORS OF THE DISTRICTS)
FROM : CWC VSP

CYCLONE WARNING BULLETIN NO. 5 AT 1200 HRS ON 6TH NOV 1996 (.) CYCLONE WARNING FOR EAST AND WEST GODAVARIES KRISHNA AND GUNTUR DISTRICTS (.) CYCLONIC STORM INTENSIFIED TO SEVERE CYCLONIC STORM AND LAY CENTRED AT 0830 HRS IST OF 6TH NOV.96 AT LATITUDE 16.0 DEGREES EAST ABOUT 200 KMS SOUTH EAST OF KAKINADA (.) MOVEMENT WESTERLY DIRECTION MAY INTENSIFY AND CROSS COAST BETWEEN ONGOLE AND VSP BY 7TH MORNING (.) RAINFALL HEAVY TO VERY HEAVY IN FEW PLACES NEXT 48 HRS CAUSING FLOODS (.) GALE WIND SPEEDS REACHING 90 TO 120 KMPH (.) DAMAGE EXPECTED TO PUCCA HOUSES, UPROOTING OF TREES, DISRUPTION OF COMMUNICATIONS (.) SEA CONDITION DANGEROUS AND FISHERMEN NOT TO GO FOR FISHING (.)

Had the cyclone been followed on a map, it would have been possible to work out the position of the cyclone at the time the bulletin no 5 had been received. This would have worked out to 65 km travelled from 0830 hrs (6.5 hrs) at the speed of 10 kmph (speed arrived at from the previous locations as at 1730 hrs on November 5 to 0830 hrs on November 6). Therefore, the cyclone's position at 1500 hrs on November 6 would have been 135 km (200-75). At this point in time, the DRO Kakinada had contacted the CWC at 1530 hrs and was informed that the cyclone had intensified to a severe cyclonic storm with

a core of hurricane winds, and was located 120 km southeast of Kakinada. The DRO sent the right order by fax to Rajahmundry at 433 hrs for evacuation from the low-lying areas, specifically in the coastal mandals.

If the assessment of the movement of the cyclone had been extended further, it would have been seen that the cyclone would have had to travel another 14 hours to reach the coast, assuming that it was moving at the same speed. The system, however, moved faster, at 25 kmph.

This is where the peculiar whimsy of tropical cyclones comes in to play, belaying even a reasonably accurate prediction of its path and future speed. The bracket identified for the cyclone's landfall was 480 km, a huge stretch to be monitored. This unpredictability has to be impressed upon administrative officials and the public, and the plans made accordingly.

In his report on the communication of messages and warnings to the Principal Secretary, Revenue Department, and the Commissioner for Relief, the Collector wrote that the messages from the Relief Commissioner at Visakhapatnam had been received over the telephone and police wireless. Other channels like fax and Nicnet had also been used, but the DWS was inadequate. The forecast put out by the IMD did not reach the District Administration on time.

Other points highlighted in the letter were:

1. The warning did not point out precisely where the cyclone would cross the coast. In fact, since the government had moved a Special Officer to the Krishna district, it was expected that the cyclone was headed for the Machilipatnam coast.
2. The cyclone suddenly changed course in the afternoon of November 6, the possibility of which had not been adequately relayed to the District Administration by the CWC.
3. Evacuation was advised for the low-lying areas, indicating a likelihood of heavy rains. There was no caution for tidal waves, which resulted in many deaths.
4. Although necessary messages were sent to the mandals, there was hardly any method of communication between the mandals and the remote fishing communities that are accessible only by country boats. To add to the muddle, as a precautionary measure, all the state transport corporation buses were halted, hampering the capacity for evacuation.

5. The CWC failed to predict the exact time of the storm. Even after the cyclone had crossed the coast, the message on the police wireless was received at midnight on November 6 that it was likely to cross on the morning of November 7. Lead time was offered where there was none.

The simplified version

The message could have been drastically simplified thus, leading to easier and faster comprehension:

TO : MROS (AMP, IPV, KRN, RCP, AVR, SNP – ABBREVIATED NAMES OF THE MANDALS)
FROM : COLL. KAKINADA

PART 1 (.) SCS NOW LOCATED AT LATITUDE 16.0 DEGREES AND LONGITUDE 84.0 DEGREES ABOUT 200 KM SOUTH EAST OF KAKINADA AND MOVING WESTERLY DIRECTION (.) LIKELY TO CROSS COAST BETWEEN ONGOLE AND VISAKHAPATNAM 7TH MORNING (.) HEAVY RAINFALL LIKELY TO CAUSE FLOODING (.) WIND SPEEDS 90 TO 120 KMPH MAY CAUSE EXTENSIVE DAMAGE TO ALL ASSETS (.) FISHERMEN ADVISED AGAINST GOING TO SEA(.)

PART 2 (.) ASSESSED POSITION 135 KM SOUTH EAST KAKINADA AND MAY CROSS OUR DIST. BY 2030 HRS BETWEEN RAJOLE AND KAKINADA IF DIRECTION NOT CHANGED (.) EVACUATE PEOPLE FROM ALL VULNERABLE VILLAGES (.)

Part 1 is the condensed version of the CWC bulletin without losing the essentials.

Part 2 is the result of the study of the previous messages, relating them to the map. It also gives executive orders to the RDO/MRO.

Implied in the above text is the awareness level of the recipient/s – it is implicit that they must be knowledgeable about the characteristics of tropical cyclones.



GRASSROOTS, NATIONAL AND REGIONAL COOPERATION

Evolution of a comprehensive disaster response programme should be a consultative process, involving all concerned parties

The central purpose of this report is to mobilise a situation that would draw the government to develop a comprehensive policy of disaster preparedness and response that could become the basis for a national rulebook

By the time we had got to the end of this book, and from the findings of our overall analysis, the urgency of the formulation of a comprehensive disaster response policy and programme became evident. In fact, the central purpose of this report is to create a situation that would draw the state government to develop a comprehensive policy on disaster preparedness and response and the mechanisms to implement such a policy.

While formulating such a policy, the need to involve the representatives of cyclone-affected communities, academicians, social workers, environmentalists, health professionals, the media, legal experts, NGOs and other members of the civil society is hereby being iterated. Appropriate legislation must be initiated by the government at the state, district and *panchayat* levels to decentralise and ensure the proper implementation of such a policy.

This report also underlines the necessity for a disaster management programme to have an integrated approach dovetailing disaster management and development. While cyclones are the focus here, a disaster management programme must place equal importance on "unconventional disasters" such as epidemics and civil strife.

We suggest a three-tier implementation programme at the state, district and *panchayat* levels. The formation of a community-based "rapid rescue force" comprising medical professionals, rescue and relief experts, military personnel and civilian volunteers is a must. They should be trained and kept primed for quick deployment in all "predicted" vulnerable areas and those with a history of disasters. Looking at the vulnerability situation in the state of Andhra Pradesh, the report also suggests the need to conduct a "risk audit" to detect regions sensitive and vulnerable to disasters. Such a risk audit, if made public, will alert the people and increase awareness and preparedness among the community and the administration. Transparency and accountability of all the constituencies involved in disaster management should be made mandatory, and a punitive value placed on their non-functioning.

A collective initiative of the civil society with the local community as the hub of action, is suggested

Further, the report strongly recommends the need to put redoubled effort into cultivating a scientific approach to avoid the panic response so typical of government. The strengthening and streamlining of the existing early warning system, supported by an active communication strategy through an agile mass media, needs to be developed. Adequate human resources should be provided through crisis intervention and disaster management, which should be a part of medical and social work and allied curricula. Emphasis should be placed on this issue during the training of Indian Administrative Officers who will ultimately be deployed as District Collectors who are pivotal to disaster management. There must be enough academic, employment and social inspiration for universities to start disaster management courses.

There is need for a collective initiative of the civil society, with the local community as the hub of action. Community-based rehabilitation programmes and the concept of civilian (community) intervention should be the prime concern of any evolving disaster management policy. This down-to-earth, grassroots approach will not only enable the local community to be self-reliant and self-confident, it will also be the most resource-effective in the long run. In the final analysis, effective coordination between the concerned government agencies, voluntary groups, the international community, professional groups and the affected community will determine the long-term outcome of a disaster management programme.

**Capacity
building of IAS
officers is highly
recommended**

Unfortunately, "long-term" is usually perceived – and so acted upon – as interchangeable with "protracted". This stretching out of completion – often because of the incessant preoccupation with detail that bureaucratise demands – can spell doom for any project. For successful implementation, a disaster-management policy requires a time-bound strategy, a firmly bracketed completion period that is also as future-proof as technology and knowledge will allow. For instance, in the case of, say, an earthquake or a riot, immediate rescue and relief operations should be over and done with in a week's time. By the end of the first month, short-term rehabilitation should become a reality. Observation tells us that for life to return to normal with minimal trauma, the complete social development of the affected people and area should take place within six months.

The process of disaster management should be initiated at various levels.

Central government

The Central government, as its name says, works on the concept, roundly debated, that centralisation is the best workable policy. In line with this thinking, a nodal agency should be set up at the national level to respond *in toto* to all disasters – natural disasters, humanmade disasters such as civil strife, and others such as urban and forest fires and epidemics. Preparedness, mitigation, relief and rehabilitation should be its key responsibilities.

To beef up the nodal agency, we suggest the formulation of a comprehensive and centripetal disaster response policy at the Central level. To complement infrastructure cementing, the modification of the insurance schemes and the tottering National Building Code is of no mean importance. Since District-Collectorship is a post Centrally despatched, capacity-building for administrators, especially at the IAS training centre at the Lal Bahadur Shastri Institute at Mussoorie, is highly recommended.

In order that the democratic virtues of knowledge-based pluralism are plumbed, the Central government must initiate an informed debate for the need for and level of "minimum standards", and an accompanying code of conduct, to ensure benchmark standards for all constituencies during disaster response.

The Central government should also constitute a Parliamentary standing committee to deal exclusively with disasters; each member of the committee must perforce spend dedicated time in Parliament to discuss issues related to disaster response. A multidisciplinary panel of specialists, technical experts, social scientists, doctors, policymakers, administrators, legal experts, academicians, journalists, donor agencies, NGOs and "concerned others" should be constituted, to both interlink with the standing committee and to act independently of it when required.

Since disaster management is by definition a chaos response mechanism, it is routinely the arena for considerable, and overlooked, human rights violations. The National Human Rights Commission (NHRC) should be entrusted with the task of, and adequately empowered for, looking into and enforcing the basic rights of the disaster-affected and disaster-prone communities.

Disaster management is equally a field day for corruption to prosper, at the hideous cost of the affected. Transparency of the resources (related to disasters) handled by the following constituencies must be ensured and be made public through a white paper on an annual basis:

- National Fund for Calamity Relief
- Prime Minister's Relief Fund
- Natural Disaster Management Division of the Ministry of Agriculture
- Member of Parliament's Fund
- Bilateral and multilateral agencies
- Public sector agencies
- Building industries
- Political parties
- Non-Governmental Organisations

State government

A replica of the national level nodal agency suggested above should be set up at the level of the state government, with the same key responsibilities. Centralisation will no doubt force such an agency to follow a step behind the Central agency, but its essential powers of action must be respected and not be fiddled with. The state government should immediately prepare a disaster response manual that would benchmark and implement

State government should prepare a manual to implement standards for disaster response operations

minimum standards and a project performance guideline for the many actors, some of them working at cross purposes, by agenda or by accident, of disaster management.

State government may constitute a standing committee of MLAs from all political parties. A fixed time may be dedicated for constructive debates in the State Assembly to evolve disaster preparedness and response programmes.

Only at the state level can awareness programmes for the general public, particularly those along the vulnerable coastline like the fishing community, and school and college students, on disaster mitigation and post-disaster response, be location-tailored and enforced. The drive sparked off at this level must be kept up at refresher courses and regular capacity-building exercises conducted for state government officials and local NGOs.

District administration

The district administration, with local and micro-level disaster response as its key responsibility, is the axis of any workable disaster management programme. Sufficient, but monitored, authorisation to all district-level legal and administrative instruments is imperative. A constantly-updated bank of information is a necessity, but it can either be a goldmine or a quagmire, depending on how much of it you can organise to put to what use. So information must be structured: district-level statistical data and other relevant information should be made available at district-level headquarters and taluka-level data at the taluka headquarters. People-oriented planning through public debates and people's participation must be the principal element of any district-level disaster planning and implementation. Within this amorphous congregation, vulnerable groups such as women, children, the elderly, the poor, and the marginalised communities deserve special attention.

In any plan, to be effective, special attention must be given to the most vulnerable like women, children and the poor

The media

The media needs to adopt a rational and proactive approach. Little so far gainsays the fact that heart-wrenching and sensational but entirely superficial stories are the staple of the media, print and audiovisual. They make for good breakfast

reading or viewing, but only now have sections of the mass media begun to perceive of disasters as more than inputs for professional creativity. Disaster theme pages in newspapers and periodicals (like those on consumer issues and gender in some periodicals) may help to facilitate an informed debate on this issue. Some were clearly plugs for media awards. Today, however, some theme pages are sincere in their objective: to conscientise a readership inured to human interest. We recommend more of the same to take the step further: to help spark off an informed policy debate. The media should undertake specialised field reportage on some of the successful local-level mitigation techniques operational during times of normalcy. Equally important, the spread of exaggerated and unscientific reportage must be discouraged.

Donor agencies (national and international)

Many donor agencies have a habit of treating disasters as episodic and disaster relief and mitigation stretched into overall development as none of their business. It is time they revisited some of their older interventions. A thorough review of their experiences in India in the context of economic and political changes is necessary before they plunge into the next disaster relief and rehabilitation programme. Increasingly, their responses must be restructured on regional realities and less on the auditing demands of those who make funds available to them. We recommend the strengthening of the existing but mutually wary NGO-Government of India committee. Their strategic plans for the next few years must be shared with each other: this would help avoid resource duplication during intervention-time. Furthermore, sector-wise specialisation and prioritisation will help strategise the limited resources always available for disaster management. Donor agencies must explain to other actors, if not to their own financial components, their own emergency policies.

Donors need to restructure their response to regional realities and local needs

NGOs

The experiences of NGOs (local and national) in disaster response, their capacities and specialisations must be reviewed, mapped and publicised. This analysis will help not just to map resources in this sector at large, it will enable the coordination of strategies that can lift disaster relief and rehabilitation out of the maze of impracticality it is currently in. It is important for NGOs

to have a comprehensive approach to disasters – integrating disasters into the larger ambit of development. Performance standards should be evolved and a public audit of their performance conducted to restructure and enhance the quality of intervention. The government, on its part, must make resources available to increase the capacity of NGOs and CBOs.

Other issues

The entire disaster management process can be rendered a heap of refuse by the absence of “minimum standards” during emergencies. The outcome of the SPHERE¹ project needs to be debated: it could singlehandedly facilitate such a process. Similarly, a debate to evolve a code of conduct during disaster response (at par with the “Code of Conduct for the International Red Cross and Red Crescent Movements and NGOs in Disaster Response”²) must be strengthened.

Evolving a regional disaster mitigation and response policy and its implementation will be a key challenge for the new millennium

The world is inexorably moving – indeed is being pushed – towards a global communitarian outlook, and the next century promises to harbingers at least a regional commonality of existence – whether it is development, democracy, despotism, or disasters. It is high time India started thinking in terms of South Asian region-level cooperation to respond to disasters, especially its two bugbears, cyclones and floods. Regional level cooperation will mean sharing experiences, technology and resources, and thus mitigate disasters that even now overflow borders, societies and stockmarkets. Evolving this unity of purpose and working towards a regional policy will be a key challenge for the various constituencies involved in disaster response for the next millennium.

¹ The SPHERE project has developed a *Humanitarian Charter and minimum standards in disaster response*. For details, please visit : <http://www.ifrc.org/pubs/sphere>

² *Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Response*: This code and its implementation are considered integral to the promotion of quality assistance during disasters by over 149 humanitarian agencies and government donors such as UK and Sweden. For details, Please visit: <http://www.ifrc.org>



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CYCLONES IN ANDHRA PRADESH

A multidisciplinary study to profile cyclone response in coastal Andhra Pradesh, India

Cyclone that devastated the coastal South Indian State of Andhra Pradesh in 1996 was just a repetition of the proverbial history. The State and the civil society, armed with the experience of dealing with numerous cyclones in the past, struggled to cope. However, the cyclone helped to galvanise the thought process of various constituencies, including those who hold divergent opinions. This yielded mixed results.

This book, developed through an inclusive and consultative process, is an independent analysis of the background, history, context, nature, impact and response to the cyclones in Andhra Pradesh, a state all set to be renamed as *Cyber Pradesh*, due to its recent initiatives and investments in the field of science and technology, mainly computers.

This book signs, perhaps, the most important basic principle in disaster management, that is - disasters like cyclones call for the synergy- that of policies and political commitments and people's action.

ECHO: *European Community Humanitarian Office* is the biggest single source of humanitarian aid in the world. ECHO works in partnership with NGOs, specialised agencies of the UN as well as the Red Cross family. ECHO's aid is channelled impartially through to the victims, regardless of race, religion or political affiliations.

HIVOS: *Humanist Institute for Cooperation with Developing Countries* (*Humanistisch Instituut voor Ontwikkelingssamenwerking*), seeks to help improve the opportunities and scope for development of people in the South. Hivos supports both organizations and their activities that enable people to assert their rights and improve access to decision-making. Hivos confines its support to organizations that are secular, independent and non-governmental.

OXFAM: *Oxfam*, a relief and sustainable development organisation, was set up in the UK in 1942. It currently works in over 70 countries. Oxfam, in close co-ordination with local NGOs, works on issues related to livelihood, education, health, gender, poverty and emergencies, with particular emphasis on people-centric disaster preparedness, mitigation and management.

